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## Stop The BAD GUYS



**Digital Security:**  
**What's Available Today**  
**& What's Coming Tomorrow**

May 2002  
\$5.95 U.S. \$7.95 Canada



### Columns

Anand Lal Shimpi

Alex "Sharky" Ross

Kyle Bennett

Chris Pirillo

Pete Loshin

Lisa Lopuck

Rob "CmdrTaco" Malda

Joan Wood

Alex St. John

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AMD 8000 Chipset Series

ATI A3/A4 Chipset

Panasonic SD Audio Player

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(putting the scare into movie moguls)

*Understand*  
Blue Laser Technology

**Mod** Your Hard Drive

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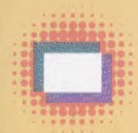
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**Seamus Blackley**



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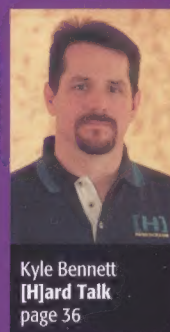
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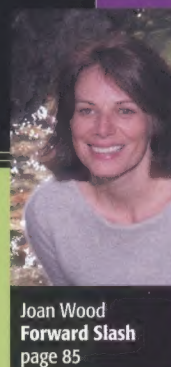
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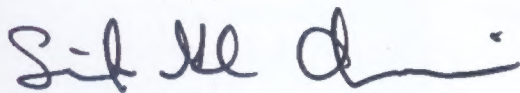


## GREETINGS FROM SAMITLAND

**W**e started on this crazy trip called *Computer Power User* six months ago. That's right—six months. This last half year has passed by in a rush. I guess the old cliché “time flies when you're having fun” really does apply to us at *CPU*. The first couple of issues we released felt like a whirlwind, churning equal parts enthusiasm, stress, anxiety, passion, and fun. It's a bit scary launching a national magazine, but our passion for the publication quickly nullified the stress and anxiety we felt early on. What remained for the last four issues (including this one) were the enthusiasm, passion, and fun. Thanks for your feedback; it's what keeps us going. I expect some of you will notice the suggestions we've taken to heart and implemented in the issues along the way. I can't speak for other magazines, but we really do listen to what you have to say, so keep your comments coming.

Our cover focus this month is biometrics. Some of you may think it sounds a bit scientific, but my guess is that you've probably never really given it a long, hard look. There's a lot in the world of biometrics that I feel will eventually involve all of us. Security and privacy are becoming more and more important every day. This no longer applies to just companies at an enterprise level, but all of us. Join us in looking at what's happening in the world of biometrics today and tomorrow.

And one last thing before I leave you to delve into the articles that pack these pages: My thoughts turn darkly to the marketing NVIDIA is using for the GeForce4 line. I have been quite incensed with the way NVIDIA has marketed its GeForce4 line to consumers, so I was pleased to find that both Sharky (pg. 35) and Kyle (pg. 36) had the same issues. You would do well to read their thoughts on this before dropping your hard-earned dollars on a GeForce4-based card. And if you haven't done so already, check out our “First Look” on the GeForce4 in the April issue (pg. 18): that GeForce4 Ti4600 is very nice indeed. On a more positive note, look for our video card roundup next month.



Samit G. Choudhuri, Publication Editor, *CPU*



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## In Hardware . . .

Eurocom's all-in-one L300P offers stiff design competition to Apple's latest iMac.



## Eurocom's All-In-One PC Takes On The iMac

Well, not literally. But Eurocom, an established force in the power notebook PC category, is basking in the peripheral glow of Apple's new all-in-one iMac. Eurocom's Windows-based L300P is, like the latest iMac, an all-in-one PC with a nice LCD and a big price tag. Although the iMac outstrips the L300P in some respects, you can have Eurocom custom-build an L300P with far better (and of course costlier) results. Here's how the starting-point L300P and the SuperDrive iMac model compare:

Features	Apple iMac, SuperDrive Model	Eurocom L300P, Basic
Processor	800MHz PowerPC G4	1.6GHz Pentium 4
Memory	256MB SDRAM	256MB RDRAM
Video	32MB DDR SGRAM	32MB DDR SGRAM
Hard Drive	60GB	20GB
Floppy Drive	None	Standard 3.5-inch
Optical Drive	DVD-R/CD-RW combo	CD-ROM
Connections	56Kbps V.90 fax/modem; 10/100 Base-T Ethernet	56Kbps V.92 WinModem; 10/100 Base-T Ethernet
Ports	USB 1.1 x3; IEEE 1394 x2; Mini-VGA x1	USB x4; IEEE 1394 x1
Wireless	AirPort ready	None
Display	15-inch LCD, 1,024 x 768 resolution	17-inch LCD, 1,280 x 1,024 resolution
Total	\$1,799	\$1,722

## Intel Says Yes To "X"

Ever since Microsoft began leaking information about its Office XP suite and Windows XP OS, "X" has become an incredibly popular letter. Intel has jumped on the X-touting bandwagon with its latest XScale-based chips for mobile devices. If you pay attention to Intel's Web site, you'll learn that the new chips offer "eXtended eXperience," "eXcellence," and "eXcitement." Dig a little, and you'll find that multimedia is key to Intel's current offering.



Intel's new PXA250 and PXA210 chips will hit at the heart of what many analysts call the future of mobile computing: Music, video, and games. Using the XScale architecture and the ARM instruction set, the PXA250 and PXA210 chips will support StrongARM-based devices such as Compaq's iPaq and compete with AMD's MIPS-based mobile chips.

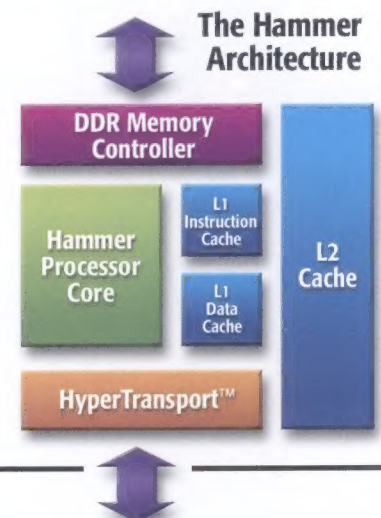
The PXA210 will be available with 133MHz and 200MHz clock speeds, and the higher-performance PXA250 will be available with 200MHz, 300MHz, and 400MHz clock speeds. The PXA210 and PXA250 will sell for about \$19 and \$32, respectively. ▲

## It's Hammer Time

Those on the lookout for new AMD chips using HyperTransport technology can keep their eyes peeled for AMD's next-generation architecture, code-named Hammer. AMD's new AMD-8000 series of chipsets will employ the Hammer architecture, with an integrated memory controller and, thanks to HyperTransport technology, a high-speed system bus.

The new high-performance chips will be able to execute both x86 (32-bit) and x86-64 (64-bit) code. This is likely to make the chips highly accessible, as it will capably satisfy desktop and mobile PC users and simultaneously offer wide scalability for server and workstation environments. AMD claims that the HyperTransport-based chips will provide a boost to overall system performance and expects that the chips' integrated memory controller will reduce memory latency.

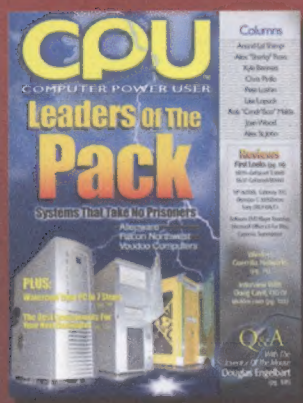
In other AMD news, the company recently acquiredAlchemy Semiconductor. The acquisition will give AMD a leg up in the Pocket PC market, something it didn't already have. Alchemy's Au1000 and Au1500 are low-power, 32-bit, MIPS-based chips that support Windows CE, Linux, and other PDA-friendly OSes. With clock speeds up to 500MHz, the Au1000 costs \$39 in units of 10,000 and will stand in direct competition with Intel's new XScale chips, including the post-StrongARM PXA250, which sports clock speeds up to 400MHz. Read our related reviews on pages 18 and 19. ▲





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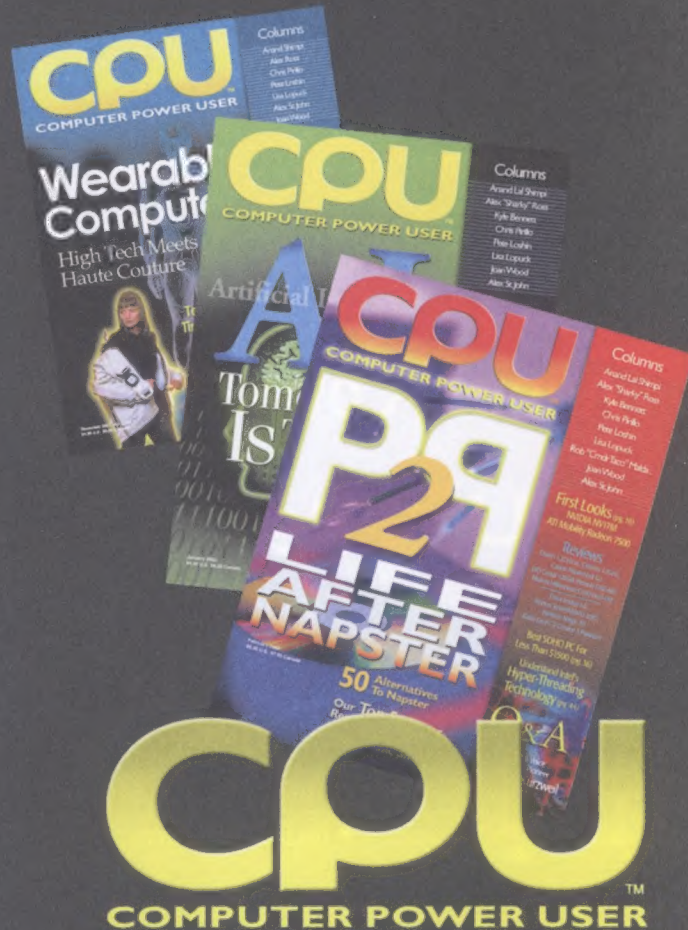
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## If Only *Superman* Were Here

Clark Kent might have given us some insight into what it's like to possess X-ray vision, but we have only to look at PNNL's (Pacific Northwest National Laboratory, [www.pnl.gov](http://www.pnl.gov)) newly developed security scanner to get an idea of how super-vision works. Built specifically for the FAA (Federal Aviation Administration), the new device scans around its subject and produces a full 360-degree holographic representation of the subject sans clothing.

It's unclear how long it will take before the device makes its debut appearance in airports. That "depends now upon whether PNNL receives additional funding from the FAA to complete the prototype," says PNNL spokesperson Staci Maloof. "We have spent several years developing this technology and believe that, once we have addressed the privacy concerns, it could be a viable technology for the FAA to consider adopting."

What happens when the government gives airport security screeners the ability to see through travelers' clothing? Only time will tell. "The imaging system is mature enough to move forward . . . but we have additional research to do . . . to address the privacy concerns," says Maloof. "These are valid concerns and will be an important influence on the final product." ▲



## Toshiba

### Neck & Neck With Big Blue

IBM is often the leader in manufacturing hard drives that are tinier than what came before. Big Blue has led the way in manufacturing 3.5-inch hard drives with the highest possible density, and the company is known for its Microdrive line of 340MB, 512MB, and 1GB hard drives for handheld devices and notebooks. Now Toshiba has weighed in with a line of 1.8-inch HDD PC cards that have capacities up to 5GB. The new 1.8-inch drives can withstand 200G of shock while operating, spin at 4,200rpm, and transfer data at 100MBps. ▲



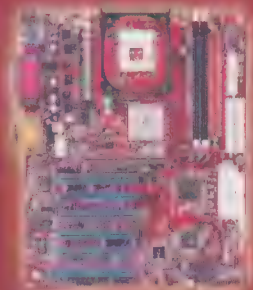
The 1.8-inch Toshiba MK5002MPL 5GB HDD PC Card is shown here at actual size.

## The Hardware Mole

Some have speculated that the true identity of our trusty hardware mole is CPU writer Michael Sweet. But the last time we checked, it looked like Michael was strapping on the headphones and grooving to Wham!. Regardless, here are a few morsels the mole unearthed around press time.

### SOYO Unleashes New Motherboards

By the time you read this, Fremont, Calif.-based SOYO Computer will have announced 12 new motherboard designs at CeBIT 2002 in Hanover, Germany. We already cover SOYO's SY-P4I Fire Dragon mainboard and its Intel Socket-478 Pentium 4 processor, i845 chipset, 400MHz FSB support, and double 184-pin DDR-SDRAM DIMM sockets that provide support for 2GB of memory. Now we can look forward to, among other motherboards, the SY-P4I Raptor. The Raptor is a Rambus version that supports Socket-478 P4 processors and will be based on the Intel i8850/ICH2 chipset; it has double 184-pin Direct Rambus RIMM sockets and will, like the Dragon, support 2GB of memory.



### Powerful 3-D & Sound In The Palm Of Your Hand

Semiconductor manufacturer STMicroelectronics recently announced that it will work with Imagination Technologies, licensor and supplier of just about any component in the digital audio-video realm, to develop processors with powerful streaming media and 3-D gaming capabilities. The alliance should yield promising results. Imagination Technologies brings to the table the smarts behind its PowerVR MBX, a low-power GPU built on a 0.13-micron core. STMicroelectronics brings its IC (integrated circuit)-making know-how, including experience in manufacturing ICs for MPEG-2 decoders, digital video set-top boxes, and smart cards.



## In Software . . .

### A Biometric Standard Is On The Horizon

**ANSI** (American National Standards Institute), under pressure from the federal government since fall of 2001 to improve biometric and encryption standards, has received support in this endeavor from the INCITS (International Committee for Information Technology Standards, formerly the

NCITS). The INCITS recently unveiled a draft biometrics specification and recommended that it be fast-tracked for ANSI approval.

The specification, labeled INCITS 358, provides an API (application programming interface) for developing biometric software. The BioAPI Consortium ([www.bioapi.com](http://www.bioapi.com)) originally developed this BioAPI, which will help programmers create biometric-related software that is usable across multiple platforms and computing environments, including Windows, Unix, and Linux.

The BioAPI will support biometric arenas such as fingerprint and iris scanning, face recognition, and even systems with a larger scope, such as the proposed national ID system. This will undoubtedly please the office of Homeland Security as it strives to improve interagency cooperation and

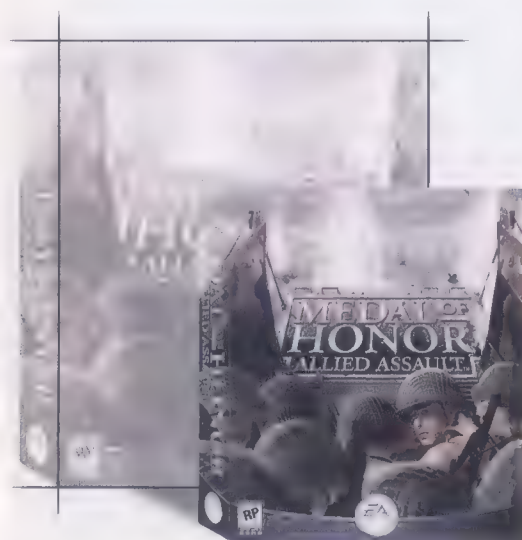
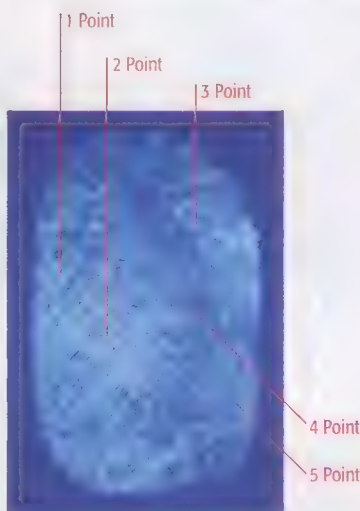
compatibility between security systems. Visionics (face recognition), SecuGen (fingerprint scanning), and SoftPro (signature authentication) are among the handful of companies that already have BioAPI-compliant products on the market. ▲

### Same Bang, Smaller Package

**R**emember when music CDs came in boxes about three times the size of a jewel case? Now PC games have finally begun making the transition from large to small packaging. Electronic Arts recently released its new WWII interactive game,

Medal of Honor: Allied Assault, using standards the IDSA (Interactive Digital Software Association) proposed in June 2000. Games using the new standard will leave the old 9.5-inch high x 7.75-inch wide x 1.25-inch deep boxes behind in favor of the new, approximately DVD-sized, 7.5-inch high x 5.25-inch wide x 1-inch deep boxes. ▲

Under the old standard, EA Games' Medal of Honor: Allied Assault would have loomed larger than it does under the new standard, but the game packs an equal amount of power.



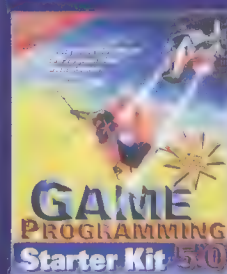
## Software Shorts

Here are a couple of interesting nuggets we ran across right before press time.

### Bored With Games? Make Your Own

Whether you've tapped and retapped every PC game that meets your high standards or you have

always wanted to break into game design, Pearson Technology Group's Macmillan Software division ([www.macmillansoftware.com](http://www.macmillansoftware.com)) has a product that's worth a look. The Game Programming Starter Kit 5.0 is the latest version of a program



designed for seasoned programmers and game-maker wannabes alike.

The Game Programming Starter Kit 5.0 includes 3D GameStudio Standard 5.12 for developing 2-D and 3-D games using C++, Microsoft's DirectX 8.0 SDK (software developer's kit), and Microsoft's Visual C++ 6.0. And with Macmillan being the publishing powerhouse that it is, it couldn't resist throwing in a book. The massive 500-page "Game Design: Secrets of the Stages" by journalist Marc Saltzman provides insight into everything you need to know to get a game off the ground. The software package has a \$49.95 retail price and is available online through Macmillan Software and major software vendors.

### Georgia Bill To Limit Sales Of Violent Video Games

The ESRB (Entertainment Software Rating Board) has long provided information and labeling for those seeking guidance about what Web sites, chat rooms, and video games might include content that could be objectionable for children. Now HB1378, a bill titled the Violent Video Game Protection Act, sponsored by four Georgia congressional representatives, threatens to make selling games that depict graphic violence to consumers under 18 a misdemeanor offense. The bill claims that video game violence is a factor that causes youth violence but doesn't cite data to support its claims. Visit the State of Georgia Web site ([www.state.ga.us](http://www.state.ga.us)) for the latest information on this bill.





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While we can't put into words the impact of a Nikon digital image, we can tell you a little about the camera that created this one. Introducing the Coolpix<sup>®</sup> 995.

It comes fully loaded with 3.34 megapixel resolution, 4x Optical Zoom-Nikkor lens, automatic exposure with manual



override, a pop-up Speedlight, and a quick review feature that instantly allows you to scroll through your images. With this many options, the only limit is your imagination. Visit [nikonusa.com](http://nikonusa.com) or call 1-800-NIKON-UX.



**Nikon**  
WE SAY: THE WORLD'S  
GREATEST PICTURES: YOURS.

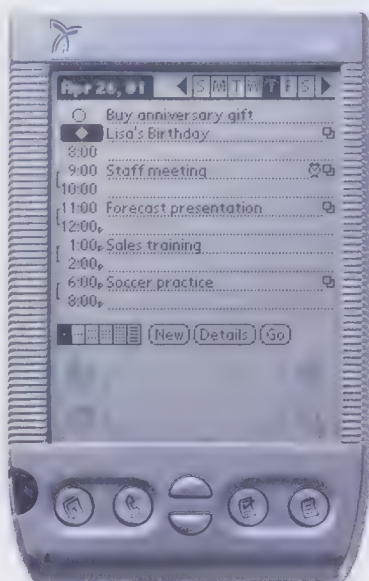
The Coolpix 995.



## Internet . . .

### EarthLink Approaches World Domination

One of the hottest tech categories still thriving is wireless technology, and EarthLink is forging an invasion into the wireless space. As part of its EarthLink Everywhere initiative, the company is now marketing a



EarthLink's new wireless Internet access plans support myriad handheld devices, including the HandSpring Visor Platinum pictured here.

number of plans that let you access the Internet (and thereby browse the Web and check e-mail) from virtually anywhere. The plans support a number of BlackBerry, Palm, and Pocket PC devices, as well as Motorola's TalkAbout T900.

Competition will undoubtedly grow fierce, but for the time being, most of the EarthLink Everywhere plans come with an attractive price tag. EarthLink's advertisement for the basic plan claims it costs \$24.95, but cost varies depend-

ing on the device. Unlimited usage plans hover at about \$39.95, and all-year, prepaid plans go for about \$399.95. For some reason, the unlimited usage plans cost more for iPAQ owners: \$59.95 per month or \$649.95 for the year. We don't get it, either.

With the availability of these plans, EarthLink now dominates the handheld Internet access market. Can world domination be far behind? Supported models include Palm's Vx, m500, and m505; Handspring's Visor lineup, including the Edge, Neo, Platinum, Prism, and Pro; Compaq's iPAQ H3600 series; and HP's Jornada 520 series and 540 series. Check the EarthLink Web site for supported OSes.

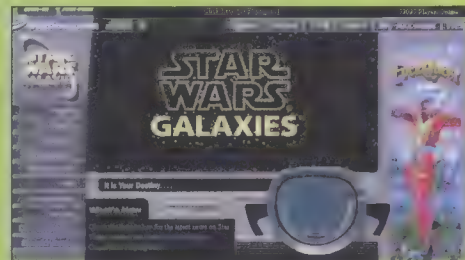
## New On The Net

Looking for some new surfing destinations? Here's a sampling of the many sites that recently hit the Web.

### Playtime At Sony

Sony's new Station.com site ([www2.station.sony.com](http://www2.station.sony.com)) keeps you up to date on the latest gaming news and provides links to dozens of games.

The site isn't designed to capture underground gaming fanatics, but if you're interested in wrapping your brain around the latest Jeopardy! puzzles or playing premium



Sony's Station.com site includes links to games such as the soon-to-arrive Star Wars Galaxies.

interactive games such as EverQuest or Sovereign, this site's for you. The site offers prizes for participating in certain games or contests, and registration is free. There's also a Community link that lets you chat about games the site covers and a Shop link to the official Sony Station store.

### Get Sound Advice From Bose

Bose's new SoundAdvisor Guide ([www.bose.com/soundadvisor](http://www.bose.com/soundadvisor)) takes you by the hand and helps you build a Bose sound system based on your personal listening preferences. If you want to buy Bose equipment, know what you want and what you can afford, but don't want to be pestered by questions and answers, go to the company's home page and click Products. If you want a gentle but annoyingly slow-loading guide to the best of Bose, try the SoundAdvisor Guide. This new portion of the Bose site includes two parts: The Sound Profiler, which lets you identify preferences, and the Room Planner, which lets you make an architecturally sound choice.

### SNMP Solutions

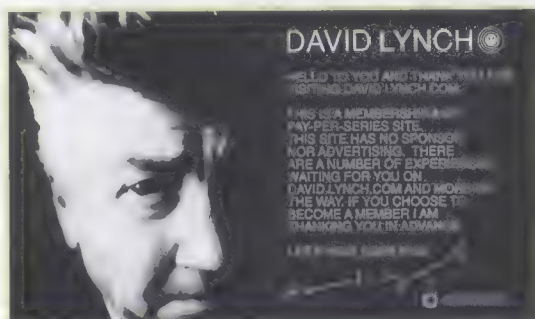
Unless you're a network administrator, you probably won't get much out of DataLink SNMP Solutions' new Web site ([www.datalinksnmp.com](http://www.datalinksnmp.com)). But if you're looking for a new source for reasonably priced SNMP (Simple Network Management Protocol) software, you might want to check out the site. We can't attest to the software's quality, but DataLink offerings include an SNMPv1-compliant System Information SNMP Agent and a System Information Monitor for viewing network information in real-time. Demo versions are available for download.



## 4th Dimension Powers New David Lynch Site

Interested in seeing the latest virtual art by acclaimed film director David Lynch? If so, Lynch's new Web site ([www.davidlynch.com](http://www.davidlynch.com)) will provide you with hours of morbid fun. Membership runs \$9.97 per month, but you don't need a membership to buy Lynch paraphernalia (say, an Eraserhead baseball cap, a Dumbland coffee mug, or the latest DVDs) from the online store.

The site's members-only "original series" include two series in-



The [www.davidlynch.com](http://www.davidlynch.com) Web site treats visitors to a virtual David Lynch play land complete with an online store and a handful of members-only "original series."

tended for mature audiences:

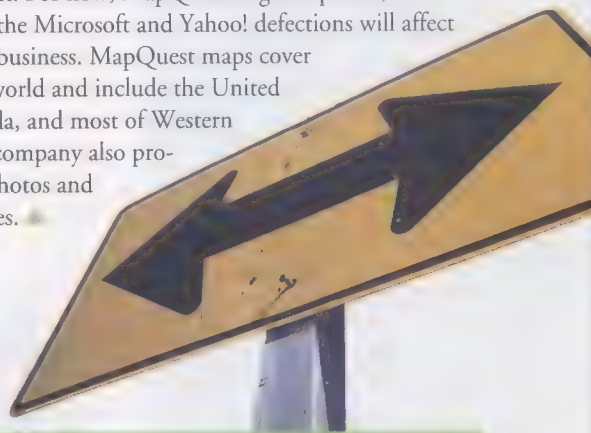
"Dumbland," an animated cartoon featuring a Lynch voiceover, which Lynch calls "a crude, stupid, violent, absurd series;" and "Axxon N.," a Lynch-style

drama. Another series, "Rabbits," about three rabbits that "live with a fearful mystery," is scheduled to be available by the time you read this. A long-time Mac fan, Lynch is using 14 Apple PowerPC G4s; 4D Inc.'s 4th Dimension database, 4D Business Kit, and WebSTAR Internet server suite; and Macromedia's Flash. You'll need QuickTime 5 and the Flash 5 plug-in to view the site.

## No Direction Home

Like a rolling stone, AOL TimeWarner's MapQuest has found its home as a third-party provider of in-vehicle driving directions and online maps for numerous Web sites. If you ever "click here for directions," chances are you've encountered MapQuest's prowess for pinpoint accuracy (or, under unluckier circumstances, its occasional lack of updated information about road closings). In yet another break with AOL Time Warner (surprise, surprise) Microsoft announced in January that it was breaking away from using MapQuest and developing its own MSN MapPoint software ([map.point.msn.com](http://map.point.msn.com)). Now Yahoo! has parted ways with MapQuest, as well.

Yahoo! announced that its newest namesake, software called Yahoo! Maps ([maps.yahoo.com](http://maps.yahoo.com)), would replace MapQuest, but the company hasn't provide detailed information about the shift. For now, MapQuest reigns supreme, but it's unclear how the Microsoft and Yahoo! defections will affect MapQuest's business. MapQuest maps cover the western world and include the United States, Canada, and most of Western Europe; the company also provides aerial photos and lodging guides.



## BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out [www.smartcomputing.com/cpumag/may02/bios](http://www.smartcomputing.com/cpumag/may02/bios) to see the entire upgrade list.

Manufacturer	File/Date Available	URL
Siemens Nixdorf	MSI 6367-N4, version 2.1 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	MSI 6367-N2, version 1.1 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	MSI 6367-N4, version 2.1 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	MSI 6367-N2, version 1.1 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	MSI 6398, version 1.1 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	LifeBook B-2131/2133, version 1.08 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	LifeBook B-2131/2133, version 1.08 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	LifeBook B-2175, version 1.06 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	LifeBook B-254/2547, version 1.53 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>
Siemens Nixdorf	LifeBook B-2545/2547, version 1.53 (02/25/02)	<a href="http://www.sni-pc.de/biosupdate/BIOSdownload_e.htm">www.sni-pc.de/biosupdate/BIOSdownload_e.htm</a>



Compiled by Steve Smith

## You Get Paid For That?

TV Trivia Writer

RewardTV

So not all CPU readers can write C++ code in their sleep. Some of you may even still think that a Token Ring has something to do with Hobbit and Middle Earth. For those of us who suspect that SQL is the name of a feminine hygiene spray, there are a few jobs that will plant you right on the cutting edge of new media with no more coding skills than your pet ferret. If you know how to watch television and take notes on irrelevant information (two widely held skill sets), you may have a career harvesting trivia for Reward TV.

This New York media company runs online TV trivia contests focusing on current hit programs such as "Buffy the Vampire Slayer" and "Malcolm in the Middle." Hey, somebody has to dredge prime time for these minutiae. According to its ad posting at mediabistro.com, the company wants "bright and energetic freelance writers to watch selected prime time TV shows and craft fun, challenging, and intelligent trivia questions for its Web site. Reward TV.com."

The pay is \$10 an hour to start, with evening work shifts on Friday through Sunday. After all, if you're the kind of couch potato this job requires, you must have kissed your weekends goodbye long ago.

## Got Broadband?

Many media companies anxiously await a more widespread distribution of broadband Web access to American households. Then, they seem to think, we will really see this medium take off. Well, maybe, but let's not start the next great "Web revolution" without first nailing down how many people really are surfing at high speeds. Estimates of the number of broadband-enabled households vary radically, says Web research firm eMarketer. The 15 professional analysts who ponder such things guesstimate that anywhere between 8.1 million and 15 million U.S. homes were wired for high speed in 2001.

Regardless, even the most conservative source regarding broadband penetration, the FCC (Federal Communications Commission), is finding that household broadband use is increasing very quickly. The FCC found that 7% of American homes subscribed to high-speed Web services in June 2001, up from 4.7% just six months earlier. The Commission Chairman, Michael Powell (yes, that's Colin's son), says that accelerating broadband deployment "is one of our highest priorities and is never far from our thoughts as we decide communications policy."



## Paying For Homeland Security

Although corporate IT budgets, and with them tech jobs, are facing a downturn across the board this year, Uncle Sam remains very high on high tech. President Bush's proposed 2003 budget calls for substantial increases in technology-related government spending, from \$48 billion for IT projects this year to \$52 billion next year.

The lion's share of that 15% increase will go toward increasing the security of the nation's information infrastructure in the wake of the Sept. 11 attacks. The newly formed Office of Homeland Security is slated to get \$722 million. Overall, and across all departments, the United States will spend \$4.2 billion to harden IT defenses against thieves and

## An American Broadband Portrait



Although industry analysts are notorious for inflated estimates of Web and PC use, let alone their projected growth, our government's FCC will have none of that. This agency has been among the most conservative of guessers about high-speed access penetration, and it says that about 9.6 million households now have broadband. Which kind of on-ramp to the super-fast Web is most popular? Cable modems continue to beat out ADSL without breaking a sweat.

Source: FCC; Numbers reflect broadband penetration in U.S. homes as of June 2001



## The Broadband Myth



Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chomeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

I can't get broadband. I live in Redmond, Washington, 2 miles from Microsoft headquarters in a community filled with Microsoft and AT&T employees and I can't get broadband. Verizon tells me my phone lines are unworthy for ADSL hookup, and AT&T spent two hours trying to get a cable modem working before the service technician gave up and called me a week later to inform me that AT&T wouldn't actually be offering broadband to my local area for another two months. I have a USA Today article pinned up in my office that claims 23% of U.S. households are on broadband and that only 41% will be on broadband by 2006. This experience has led to me to wonder if broadband is actually a myth cooked up by tech companies to raise public capital.

I want to challenge your understanding of broadband. The word "bandwidth" gets thrown around a lot but does anybody really think about what "bandwidth" is made out of? We all have plumbing in our homes. The "bandwidth" of your plumbing is limited by the diameter of your pipes. Bandwidth doesn't actually tell you anything about how much water you're going to be able to get per second; it just tells you what the most can be. What if the water delivered through our pipes was sent as steam instead of as a liquid? Then we would get less water in the same unit of time over the same "bandwidth" because steam is a much less compact form to deliver water in. What's my point? Adding more "bandwidth" to your home doesn't increase your data pressure or the compactness of the data being delivered over the pipes. The average Internet user on a modem today wastes 150 to 300MB of bandwidth per month connected to the Internet; you can't even use the bandwidth you already have. Your Web experience is cumbersome because the way Web content is built and delivered to your computer is inefficient not necessarily because you lack "bandwidth."

A conventionally compressed video game download is typically 100-to 1000x larger than it needs to be; it's delivered as steam. Video isn't compressed so much as it is stripped of visually irrelevant data. Recent advances in video compression have shown that the video we get off the Net today is at least several times larger than it needs to be as well.

Our bandwidth woes are not getting better with broadband adoption, they're getting worse. How can that be? Take a look at the bandwidth table I provided; it provides a rough estimate of the relative bandwidths of different technologies that move data

around our computers. Observe that the 56.6Kbps modem is the slowest source of data available to your computer, followed closely by broadband, which is marginally faster than the first 1X CD-ROM drives available for your computer in 1993 were. A modern DVD-ROM drive is theoretically 170X faster, but those are so slow you usually have to copy most video games to your hard drive, which is usually several times as fast as that. By the time data gets to your CPU, it's getting processed 2.3 million times faster than your modem can deliver it.

To put that in perspective, consider a lone workman on an assembly line whose job it is to tighten a bolt on a widget as it comes down the belt. The workman (CPU) needs 1 second to complete the task. If the conveyor belt is delivering widgets to work on at modem speeds, then the workman is standing idle for roughly 1 month between the arrival of widgets. With broadband he's standing idle for only 24 hours! So why is the problem getting worse? Moore's Law has been stretching the gap between the bandwidth inside your computer and the bandwidth to your computer. The average amount of time our workman stands idle is increasing over time, not decreasing, because computers improve faster than your Internet connection does. Even as broadband adoption increases, the relative bandwidth into your computer is in rapid decline. In the year 2010, when everyone has broadband, your 70GHz CPU will be sucking through data so fast that your broadband connection will feel like a 300 baud modem without huge advances in compression technology. ■

Talk to the man at [TheSaint@cpumag.com](mailto:TheSaint@cpumag.com).

	Kb/sec	Multiple
<b>Modem</b>	57	1
<b>ISDN</b>	128	2
<b>1x CD</b>	1,200	21
<b>ADSL/Cable modem</b>	1,536	27
<b>1x DVD</b>	9,600	170
<b>HD</b>	81,920	1,447
<b>LAN</b>	102,400	1,809
<b>133mhz bus</b>	8,716,288	153,999
<b>400mhz bus</b>	26,214,400	463,155
<b>2Ghz CPU</b>	134,217,728	2,371,354
<b>70Ghz CPU</b>	4,697,620,480	82,997,401



## room to burn



VINYL



DIGITAL VIDEO



DATA BACKUP



ORIGINAL MUSIC



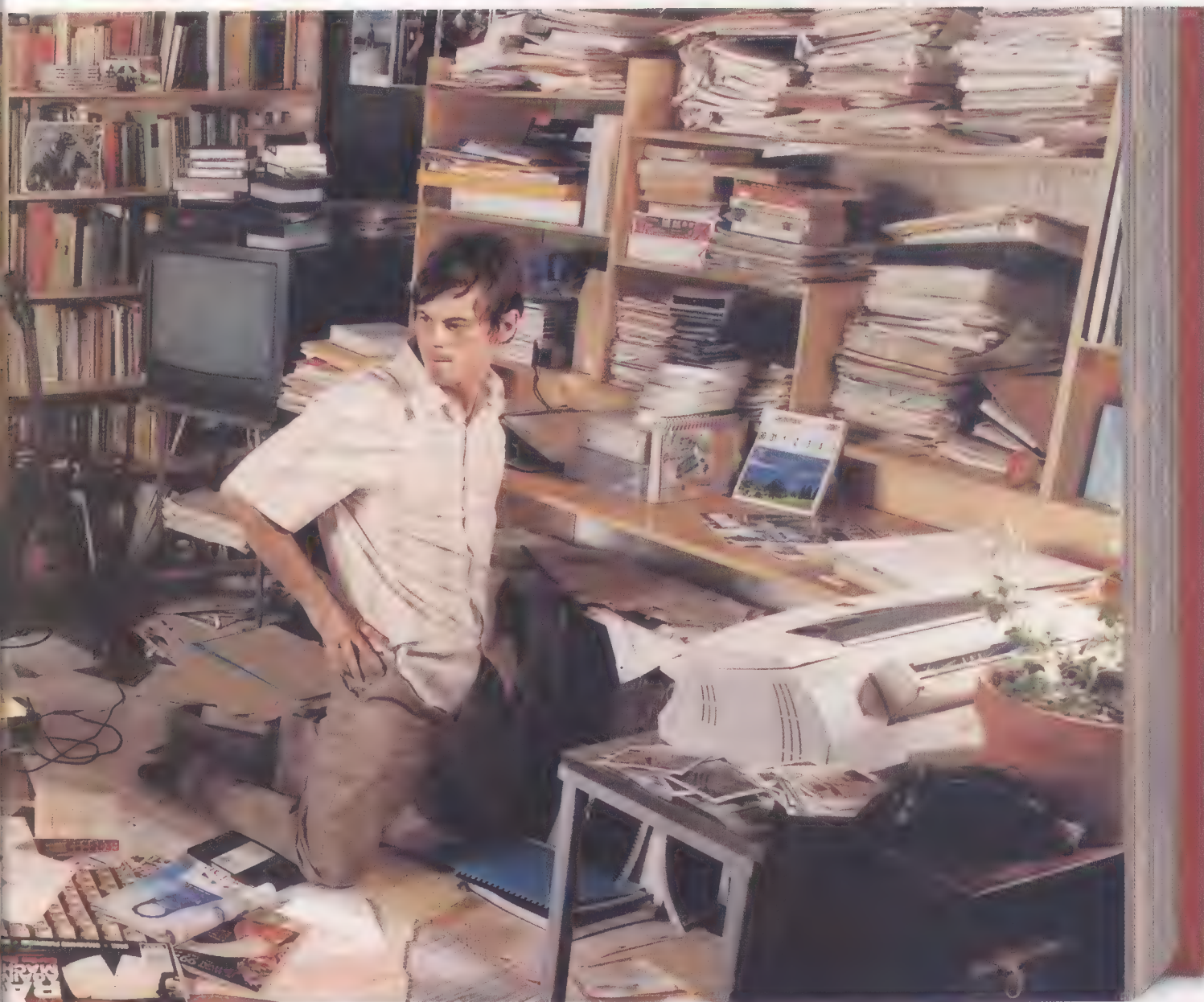
DIGITAL PHOTO



MP3







Get organized, and take your files with you wherever you go. Burn all your data, video, photography, MP3s, vinyl, cassettes and whatever else you've got to CD with Easy CD Creator® 5 Platinum, from Roxio. The best selling CD burning software in the world. You can even create your own personalized jewel cases for each disc. Hit [roxio.com](http://roxio.com) to find out how. Mac® users check out Roxio's Toast® 5.

*Now Windows® XP compatible.*





# EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

It's all about image. The digital pic showing on your car stereo, for example, or the Toshirō Mifune samurai flick playing on the entire wall of your home theatre. Or maybe the JPEG you took last summer of the mako shark trying to play fetch with your shinbone. Take your images to the extreme with this month's fix of extreme hardware.

by Marty Sems



## Sony MEX-5DI

You've tried everything to attract a date. You've put ridiculous coffee-can wheels on your lowered Prelude, trolled slowly around town with your subwoofers booming, and even attached all the neon lights and plastic flares in the JC Whitney catalog, but all to no avail. Get that reluctant babe out of your dreams and into your car with this Sony car stereo for the most recent MTV generation. The MEX-5DI will give her something to look at when she can tear her eyes off your fly hoopty. You can use Memory Sticks (what else?) to put digital images from album covers to animated GIFs on the MEX-5DI's 4.5-inch color TFT screen. Tunewise, this head unit can play MP3s and other music formats from CDs, CD-RWs, and Memory Sticks. Look for it in April for about a grand, rolling Romeo ([www.sel.sony.com](http://www.sel.sony.com)).



## Digital Projection Lightning 25sx

Five-foot plasma screens jolt our senses and shock our credit cards, but for real digital home theatre, nothing strikes us like the Lightning 25sx digital projector (\$124,995; [www.digitalprojection.com](http://www.digitalprojection.com)). If its blinding 14,000 lumens brightness rating reminds you of a real movie theater projector, it should—this projector has a xenon arc bulb that requires a 208v



to 240v power line. Trust us when we say that the Lightning 25sx handles almost any TV, HDTV, or computer video standard you're likely to use and can project it beautifully at a 1,280 x 1,024 resolution. Are projectors like this ready for the big screen? Well, hardware provider Digital Cinema Solutions thought a Digital Projection model costing a mere \$60,000 was good enough to show "Wendigo," the first feature-length movie released to selected theatres in a digital format.



### SeaLife SL121 Reefmaster DC200

Everybody has a buddy that won't shut up. "My blah blah megapixel camera does this, this, and this," he babbles on. Ask him, "Is it waterproof?" Then chuck it into the ocean to find out. You can snap photos of his wet wonder on the way down to its watery grave with your SeaLife SL121 Reefmaster DC200 ([www.sealife-cameras.com](http://www.sealife-cameras.com)). This 1.3-megapixel underwater digicam costs about 750 clams as shown with the SL960 external flash and is watertight down to 200 feet. It comes with 8MB of internal memory, a CompactFlash Type II slot, and stainless steel NiMH batteries. You can even pop open the unit's tough outer shell and use the camera normally on dry land. Strap on your Jacques—your Jacques Cousteau diving suit, that is—and take this Reefmaster for a swim.

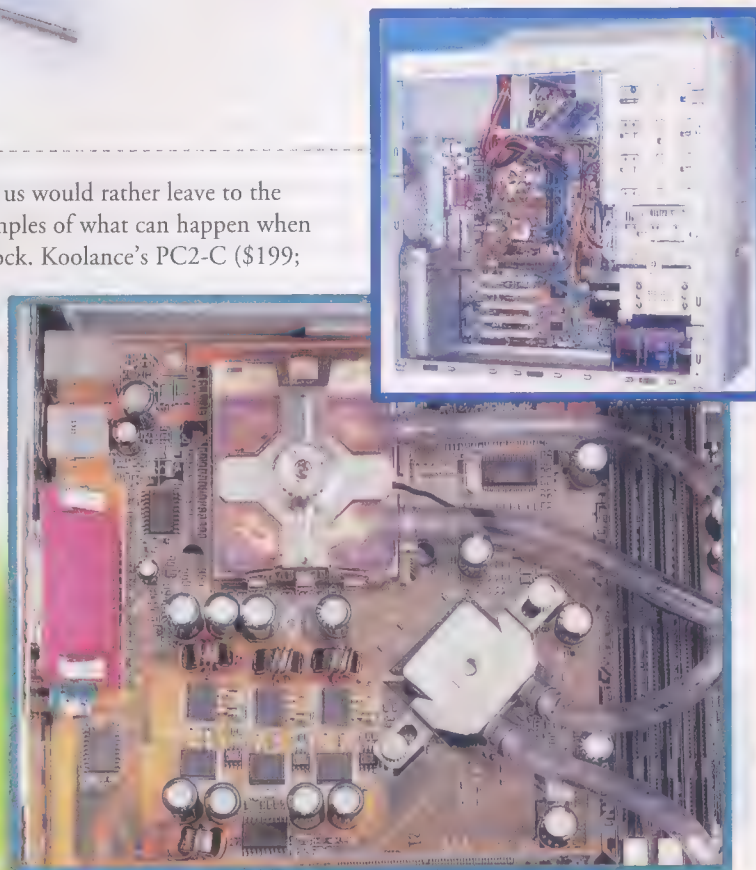


### SONICblue ProGear ■ 1050

Take a Sawzall to those marionette strings, Pinocchio, and skip about where you please. You're wireless now, bud. You could think of wireless Web pads like SONICblue's new ProGear SE 1050 (\$3,299; [www.sonicblue.com](http://www.sonicblue.com)) as overpriced, underpowered notebooks, or you could see them as the next wave in network app clients or couchbound Web surfing. There's a lot to like in the ProGear, including its 1,024 x 768 touch screen and 802.11b connection. Its trippy magnesium case also holds a Cardbus slot, USB and IrDA ports, and a relatively decent speaker. Try to ignore the 400MHz Transmeta processor, though. The SE model comes with Windows 98 SE and IE5. If your veins flow, er, penguin blood, check out the ProGear 1050 LX (\$2,799) with Mobile Linux 2.4 and Navigator 4.7. Jumpin' Jiminy.

### Koolance PC2-C Liquid-Cooled Case

We love modding cases, but there are some things some of us would rather leave to the experts. Liquid CPU-cooling is one of them. We've seen examples of what can happen when you run a garden hose through a homemade CPU cooling block. Koolance's PC2-C (\$199; [www.koolance.com](http://www.koolance.com)) is actually the light model in the company's lineup of condensation-free, liquid-cooled cases. It comes with no power supply and just one CPU cooling block, but you can buy other blocks for your chipset, hard drive, and video card, as shown. Three 80mm blowhole fans keep the Koolance cool. The case will even sound an alarm and automatically shut down if things get too hot. A drier (but noisier) alternative is the pre-modded Enermax CS5190AL-051 (\$399; [www.enermax.com.tw](http://www.enermax.com.tw)). It's a radical aluminum tower case with a red automotive paint job. It also has room for *seven* case fans, so keep small children and pets a safe distance from this voracious suck-box. How does it look? Well, like a cross between the slanted buildings in "Blade Runner" and Maximilian, the wicked robot from "The Black Hole."







## AMD Hammer Architecture



The 754-pin ClawHammer is on top, and the 940-pin SledgeHammer is on the bottom.

### Hammer Architecture

To Be Announced

AMD

(408) 732-2400

(800) 538-8450

www.amd.com

Preview: No Rating

Once in awhile, I get to see something really nifty, really early and then get slapped with an NDA, meaning I can't talk about it. This isn't one of those times. I recently got to see the first demonstration of AMD's next-generation x86-64 architecture in action. Code-named "Hammer," the architecture is to become a foundation across multiple platforms including the desktop, workstation, mobile, and server markets.

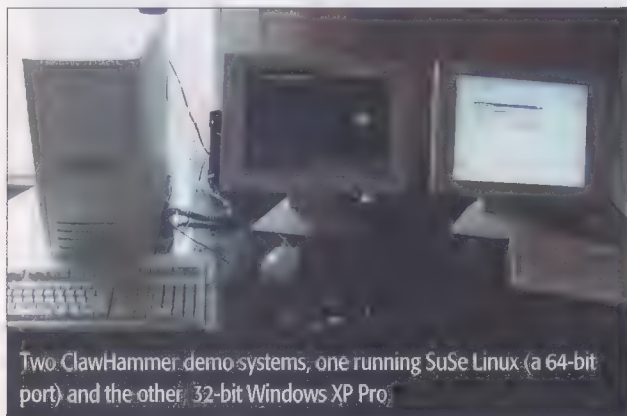
Hammer integrates a single or dual DDR memory controller with support for PC1600, PC2100, and the upcoming PC2700 DDR-SDRAM. Integration of the memory controller is key and strays away from the more traditional functions of a Northbridge. As such, this new design reduces DRAM latency and increases memory bandwidth (up to 5.3GBps), capacity, and speed. (Memory bandwidth and capacity scale as you add CPUs.) It's also worth noting that the memory controller will now be able to address and execute commands at the same clock frequency as the CPU itself (1:1 scaling). Hammer includes AMD's HyperTransport technology (also used in Xbox), which acts as a high-speed, low pin-count, asynchronous, point-to-point link connecting other Hammer chips. Scalability is key with support for 1P (processor), 2P (using "ClawHammer" chips), 4P, and 8P (using "SledgeHammer" chips). AMD's "Lego" building approach enables glueless multiprocessing and gives a very cost-effective alternative to the "Big Iron" mainframe approach. The core sports x86-64 technology, a 12-stage superscalar pipeline (up from eight on the Athlon XP), enlarged two-level TLBs (translation lookaside buffers), a TLB flush filter, enhanced branch prediction, and large caches (size not yet released).

Higher clock speeds should theoretically be possible. The six integer units and three FPUs are carried over from the K7 design. The Hammer core is based upon a 0.13-micron SOI (Silicon-on-Insulator) process

out of AMD's FAB30 in Dresden. AMD was reluctant to disclose the clock speed of the CPUs that were running the demos, but the company did mention they were as fast as the competitor's 64-bit CPU (Itanium/McKinley). Even if it was roughly 1GHz, there have been rumblings about a Q4 target release as high as 2GHz. We'll see.

The ClawHammer has 754 pins, while the SledgeHammer has 940, which is more than double that of the current Athlon XP. Why? That's what happens when you have two additional HyperTransport I/O links plus the dual channel 64-bit DDR memory controller instead of the single channel controller on ClawHammer. ClawHammer will be aimed at the desktop/workstation market in either single or dual configurations harboring support for unbuffered memory on a 64-bit-wide bus. But for the first time, AMD chips will be able to go beyond that dual-MP level, thanks to SledgeHammer's 4/8 way server capabilities using 128-bit dual channel DDR controllers. With 6.4GBps coherent HyperTransport links (high speed chip-to-chip interconnecting) at Hammer's disposal, bandwidth isn't likely to be a problem. ClawHammer and SledgeHammer will both feature integrated heat spreaders (similar to Intel's) to combat complaints about damaging AMD cores when installing the heat sink/fan.

The Hammer architecture is designed to run in three modes: 32-bit, compatibility (when under control of a 64-bit OS, existing 32-bit apps can still run with no application recompile or emulation layer required), and 64-bit. Because 64-bit computing is far from mainstream, the Hammer architecture is also designed for 32-bit applications, allowing for more of a hybrid solution than Intel's IA-64 based Itanium solution. When asked about the move from 32-bit to 64-bit, AMD's Product Marketing Engineer, John Crank, said, "I think we can all agree. It's not a question of if but when." For what it's worth, and to appease the noisy majority that will keep computing at 32-bit, he added that with the performance of the Hammer, "You can expect a 25% performance boost in 32-bit apps over Athlon XP clock for clock." So gamers needn't worry. ▲



Two ClawHammer demo systems, one running SuSe Linux (a 64-bit port) and the other, 32-bit Windows XP Pro.

by Alex "Sharky" Ross



# AMD 8000 Chipset Series

**A**MD's new Hammer is going to need a chipset architecture to support its hefty needs if the company is to get the best out of it. At the Claw-Hammer demo, I saw a month-old A0-stepping (that means hot off the slabs) of AMD's 8000 series of chipsets, which ran the demos that I mentioned in the AMD Hammer preview on page 18.

I saw three new chipsets: the AMD-8151, AMD-8131 and AMD-8111 for the first time. Bearing in mind that the best AMD currently has to offer the server market is the 760-chipset, the 8000 series looks to be an ambitious technological step forward. A traditional Northbridge chipset is now redundant: The memory control, multiprocessing control, and I/O functionality normally associated with the Northbridge component are all integrated as part of the Hammer processor architecture.

The AMD-8151 is an AGP 3.0-compliant graphics tunnel supporting 8x AGP. It's also compliant with AGP 2.0 specification signaling, allowing for 1x, 2x, and 4x transfer modes, so don't chuck your \$400 GeForce4 Ti 4600 cards out just yet. The tunnel function provides connection capability to other downstream HyperTransport technology devices. A front-end HyperTransport interface (dubbed Side A) provides a configurable 16-bit-wide communication path to the host, allowing for a maximum of 6.4GBps of bandwidth. The back-end HyperTransport interface (Side B) provides a configurable 8-bit-wide communication path to a downstream device with a maximum of 1.6GBps of bandwidth. The 8151 comes in a 564-pin OBGA package. Taking AMD's Lego approach, the 8151 should be a fundamental building block for desktop and workstation applications (assuming AMD goes with the Mind-storms version and not Duplo) gamers, game developers, and most of us use. However, the AGP slots in the demo machines were empty, as in not working.

For workstation and server applications, the AMD-8131 HyperTransport PCI-X tunnel provides two independent PCI-X bus bridges integrated via (you guessed it) HyperTransport. Once again, the tunnel function permits connectivity between other downstream HyperTransport devices. Like the AMD-8151, the AMD-8131's front-end (Side A) HyperTransport interface provides a 16-bit-wide communication path to the host, for as much as 6.4GBps of bandwidth. But the back-end

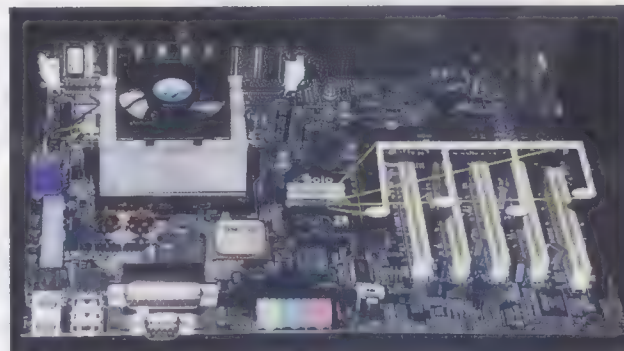
HyperTransport interface (Side B) provides a configurable 8-bit-wide communication path to a downstream device, allowing as much as 3.2GBps of bandwidth. The two PCI-X bridges (A and B) not only support transfer rates of 133MHz, 100MHz, 66MHz, and 33MHz PCI-X modes, but also PCI 2.2 legacy. The 8131 has a pin count of 829 and is dressed in an OBGA (Organic Ball Grid Array) package.

Thanks to HyperTransport, AMD 8000-based mainboards won't be using a traditional Southbridge. Instead, the 8111 HyperTransport I/O hub will provide the necessary I/O functionality, integrating storage, connectivity, audio, I/O expansion, security, and system management functions into a single device and a 492-pin PBGA (Plastic Ball Grid Array) package. The HyperTransport link provides 8-bit upstream/downstream between the Host and 8111 I/O hub supporting up to 800MBps of bandwidth. The 8111 manages data traffic with peripherals such as USB ports (USB 2.0), IDE control (supporting ATA-33, -66, -100 and -133 transfer modes), and 32-bit/33MHz PCI bus that we all know and love/hate.

AMD's John Crank stated that chipset vendors such as VIA, Ali, SiS and NVIDIA are not only monitoring the chipset closely but already have plans to design and produce their own chipsets to support the Hammer processor. As usual, there will likely be a barrage of motherboards from ASUS, MSI, Gigabyte, and crew to choose from. Take a long hard look at the shot included; not only do the musical notes below the processor socket represent the Intel jingle, but this is likely the last time you'll see the 8000 until it comes out by Q4 of this year.

Clearly when coupled with as many as eight SledgeHammers, the enterprise and server market should have a cost-effective solution from AMD for the first time that will not only compete with Intel but, AMD hopes, will knock on the doors of "Big Iron." ▲

The AMD 8000 chipset series, complete with musical notes above the AMD logo representing the Intel jingle just for fun.



## 8000 Chipset

To Be Announced

AMD

(408) 732-2400

(800) 538-8450

www.amd.com

Preview: No Rating

.....

by Alex "Sharky" Ross





## First Look: Preview

## ATI A3/A4 Chipset

ATI is best known for its Radeon (R200) graphics chip-based products, currently going toe to toe with NVIDIA's GeForce4 Ti (NV25) series in the high-end desktop and mobile sectors. Until now, NVIDIA has been one up on ATI with regard to the value segment mainboard chipset market, simply because ATI had not entered the arena. Despite the fact that NVIDIA's nForce chipset has not yet been widely accepted, ATI has decided to throw its hat into the ring with the ATI A3 and A4 family of chipsets.

The Northbridge consists of ATI's Radeon IGP (Integrated Graphics Processor) and an asynchronous 64-bit DDR-200/266

memory (DDR333 later this year) controller with 2.1GBps available on a single channel. Onboard graphics are provided by a 128-bit 3D/2D integrated Radeon 7000 core (the Radeon VE on the desktop) with a 4MB to 64MB frame buffer (SMI mode) shared with system memory. Obviously, the Radeon 7000 won't set any performance records, but it isn't meant to. Instead, it raises the bar at the value end by including ATI's Pixel Tapestry, Hyper Z, Video Immersion, and Hydravision technologies. Hyper Z, which saves bandwidth, might work out best on an integrated solution. The integrated TV encoder will save money, and DVD quality should be stellar, thanks to ATI's high-quality deinterlacing. This may not be enough for desktop users, but the mobile space could certainly benefit from such features. And in case you want to plug in your own 3-D accelerator, an AGP4X port will be available for the desktop version. Going forward, we were told the current desktop R200 core will be included in future IGP cores.

The Southbridge should give OEMs several choices. Using ATI's own IXP (I/O communication processor), Southbridge will harbor benefits from their A-Link (double the bandwidth of PCI) connectivity to the IGP Northbridge. However OEMs can also choose to leverage their existing engineering investment in a third-party Southbridge. When released later this summer, ATI's IXP will come in two flavors: the 200 and

the 250. The I/O functions will include 3Com-branded, on-board Ethernet; on-board AC97 audio; USB 2.0 support; and an ATA-100 controller. It seems likely that OEMs will ship A3/A4-based mainboards with an ALi or VIA Southbridge to get to market by May.

Considering all the different iterations of the A3/A4, ATI plans to follow NVIDIA's lead by using a unified driver program for the A3/A4, which includes a unified software stack composed of the system BIOS, video BIOS, graphics driver, Ethernet driver, and Southbridge drivers. Thanks to ATI's universal platform "FlexFit" architecture, the company will have all four bases covered in any of the available mainstream arenas with chipset solutions for the AMD Athlon/Duron on desktop (320) and mobile (320M) as well as Intel P4 desktop (330/340) and mobile (340M). But can ATI hit a home run? Its share in the mobile discrete graphics market is still 60%, and there is little competition in the P4 mobile sector (other than Intel), so there are certainly inroads to be made with the A4. Another positive for the mobile A3/A4 comes from space-saving integration of the master clock, TV Encoder, Dual Display, and LVDS allowing for smaller footprints, essential for thin and light mobile PCs. And with ATI's Power-Play, end users could realize slightly longer battery life.

ATI is set to go directly at the Intel P4 market. Having acquired the Intel P4 bus license, which NVIDIA has yet to do, ATI's A4 chipset solution will come in two flavors. At the low end will be the IGP 330 with its 400MHz FSB (frontside bus) support, while the IGP 340 and its 533MHz FSB should cater to the newer and faster P4s on the horizon. A quick look at performance of a P4 notebook using the A4 revealed 3DMark 2001 and Quake III scores that were promising for a mobile integrated solution. On the Athlon/Duron desktop side, competition is much stiffer for the A3, where performance is high even at the low end. NVIDIA's nForce still poses the most impressive all-around package for integrated graphics solutions, but with SiS and VIA also entering the fray, things could get crowded. It will ultimately come down to who can offer the cheapest viable solution. ▲

by Alex "Sharky" Ross



### ATI A3/A4 Chipset

To Be Announced

ATI

(905) 882-2600

www.ati.com

Preview: No Rating





# VIA Apollo KT333

Gamers and enthusiasts looking for the best socket A in which to stick their Athlon XP have championed VIA's KT266A platform. In terms of technology, the KT266A won the hearts of OEMs, even when facing stiff competition from the SiS 745 and NVIDIA's nForce 420. And the ball keeps rolling, thanks to VIA's new chipset, the Apollo KT333.

The KT333's Northbridge, now called the VT8367, is essentially the same as the KT266's, except for an updated memory controller to support the new DDR333 standard, which operates at 166MHz, up from 133MHz for DDR266 SDRAM. VIA also claims to have made timing improvements over the KT266A's controller. By lowering the memory subsystem latency and increasing the buffer size, bandwidth is slightly greater than the KT266A's Northbridge, even when using DDR266. KT333 is also part of VIA's V-Map (VIA Modular Architecture Platform) family of technology. The 552-pin Northbridge is a pin-compatible replacement for the KT266A, which should help OEMs transition cheaper and quicker.

The KT333 introduces a new VT8233A Southbridge, yet another version of VIA's I/O controller chip. New to this iteration is the addition of Ultra ATA-133 support, offering even more bandwidth for data transfer between storage devices and the CPU. Another bonus is that those Super-Sized "BigDrive" hard drives (above 137GB) will work. In keeping with VIA's way, the Northbridge and Southbridge are connected with the V-Link interconnect bus.

But don't let the addition of DDR333 and ATA-133 support take you over the edge just yet. As great as it sounds, it seems there's a bit of a marketing minefield to consider. At press time, JEDEC hadn't officially rubber stamped the DDR333 standard, even though plenty of PC2700 modules are already on sale. This means you are effectively buying overclocked DDR266. Experience with these PC2700 modules runs from good to crap. Though DDR333 at 2.7GBps has a theoretical 25% peak bandwidth advantage over DDR266 at 2.1GBps, that does not translate into anything useful because the Athlon XP and its 133MHz FSB is maxed out at 2.1GBps. AMD hasn't officially announced plans to shift to a higher-speed 166MHz FSB in the

near future, so that 25% extra is stuck in the mud. ATA-133 ups the max transfer limit to 133-MBps from the 100MBps level of ATA-100, but in today's world, I doubt many of you are exceeding 100MBps. Even so, don't hold your breath for performance gains.

Those of you who just recently jumped on to a KT266A platform for the Athlon XP needn't feel aggrieved. The KT333 chipset is more of an evolutionary than revolutionary product for VIA, who for the first time is bringing ATA-133 and DDR333 to the socket A table. The performance of the KT266A is still almost as good, and you might be better off waiting until DDR333 and ATA-133 become standards that are more than just certified, meaning ones that we all actually use. Need any more proof to keep a hold of your trusty KT266A? Benchmarks run on a KT333 with CAS-2 PC2700 memory yielded roughly a 1.5% performance gain over the same system using PC2100 memory and the KT266A. Quake III did show better promise of what you can expect with DDR333 but still not exactly groundbreaking stuff. So if you already own a KT266A, don't worry; be chuffed.

On the other hand, those of you purchasing an Athlon XP and looking for the top-performing platform needn't look further than the KT333. It shouldn't cost more than a KT266A, will open the door to ATA-133 and DDR333, and is the crème de la crème when it comes to performance. Expect KT333-based motherboards from Asus, MSI, Gigabyte and Soyo to be in stores by the time you read this. ▲

by Alex "Sharky" Ross



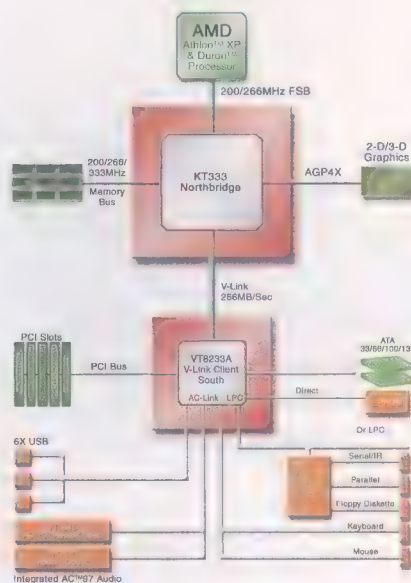
## Apollo KT333

Approximately \$180 for KT333-based motherboards

VIA Technologies

(510) 683-3300

www.viatech.com



## How The KT333 Stacks Up

	KT333	KT266A	nForce 420
3DMark 2001	8328	8159	7807
SYSmark2002 Internet Content Creation	216	214	211
SYSmark2002 Office Apps	142	140	136
Quake III	261fps	246fps	240fps

\*Tested on an Athlon XP 2000+ WinXP Pro

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



## Philips DVDRW208



### DVDRW208

\$499

Philips Electronics

(800) 326-6586

(212) 536-0500

www.pcstuff.philips.com



While other drive makers are slapping their own brand names on outsourced DVD+RW drives, Philips' DVDRW208 (aka DVD+RW ReWriter) is Philips-made. One thing the DVD+RW group (as opposed to the DVD-R/RAM group) has going for it is that most DVD+RW drives you can purchase today also include CD-R/RW capabilities. The DVDRW208 is such a combo drive.

The DVDRW208 is similar in usability to what CD-RW users are accustomed. It comes with Roxio's Easy DVD Creator, Easy CD Creator, and DirectCD. Like most DVD+RW drives, the DVDRW208 has a 2MB buffer and supports track at once, disc at once, session at once, incremental packet writing, multisession, and DVD random writing methods.

The DVDRW208's data transfer speeds are on par with similar drives, but its burn speeds are awesome. Our lab techs hooked the drive up

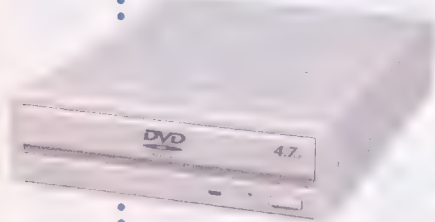
to our PC with a 1GHz Pentium III processor, 256MB of RAM, a 7.8GB hard drive, and an ATI Radeon 8500 AGP video card with 64MB of DDR-SDRAM, running Windows Me. In our benchmarks, the drive reached a maximum 2,513KBps (1.86X) data transfer rate for DVD and a max 2,407KBps (16.05X) for CD.

In practical testing, the DVDRW208 burned 427MB of data to a Memorex DVD+RW in a smokin' 3:40 (minutes:seconds), to CD-R in 5:09, and to CD-RW in 5:56. The good speeds taxed our system, though; average CPU utilization at DVD 1X was 52%.

The drive supports all popular CD formats plus DVD+RW, DVD-ROM, and DVD-Video, so you can burn home videos to DVD and play them in any second-gen DVD player. Given that recordable DVD formats are in flux, if you must buy now, the DVDRW208 should serve all your CD/DVD burning needs. ▲

by Cal Clinchard

## QPS Que! DVDBurner



### Que! DVDBurner

\$349

QPS

(800) 559-4777

(714) 692-5573

www.qps-inc.com



QPS' Que! DVDBurner is a zippy DVD-R/RAM drive, and its features are in line with the best the DVD-R/RAM format currently has to offer. I enjoyed it from the moment I placed a DVD-RAM cartridge in the drive, opened Windows Explorer, and dragged and dropped a 427MB file from the C: drive to Memorex DVD-RAM in 6:44 (minutes:seconds) without having to go through special DVD-burning software. It took 5:40 to burn the same data to DVD-R.

The DVDBurner doesn't burn CD-R/RWs, and most DVD+RW drives do. But the recordable DVD industry is barely out of diapers (at least in terms of consumer models for PCs). Lest the DVD+RW kids get too smug, they should watch their backs for combo models that DVD-R/RAM drive makers have in the works for Q3/Q4 2002.

Like some other drives in the DVD-R/RAM family, the DVDBurner is a Matsushita Electronics-made model #LF-D311SC, so keep an eye out for that when

comparison shopping. Software bundles are the main distinguishing feature between identical models with different branding, and the DVDBurner comes with an ironclad bundle: MedioStream's neoDVD Standard, CyberLink's PowerDVD 3.0, and VOB Instant CD/DVD 6. The VOB software is awesome; it let me back up a 6.32GB hard drive to DVD-RAM in 2 hours and 44 minutes with an easy-as-pie interface.

The DVDBurner supports all the popular CD formats and DVD-R, DVD-RAM, DVD-ROM, and DVD-Video. You can burn home movies to DVD and play them back in any second-generation DVD player.

The drive has pretty steep system requirements for DVD authoring (check out the QPS site for details), but they're about on par with comparable models. If I were going to choose a drive today strictly for video making and DVD-RAM storage, I'd buy this one. ▲

by Cal Clinchard



## Nikon Coolpix 5000

Nikon's digital cameras are known for unconventional designs and countless user settings. The Coolpix 5000 has 5 megapixels and a more traditional look than many Nikons, but it's as feature-laden as earlier models.

The camera has a 3X Zoom-Nikkor f-7.1-21mm (28mm to 85mm on a 35mm camera) lens and bundles USB and video cables, a 32MB Compact Flash card, a Li-Ion battery pack, and a battery charger. The battery-compartment door is on the camera's underside, so don't bump it.

The Coolpix 5000 provides a wide viewing range with a swiveling LCD. Three buttons above the screen make menu access quick, but navigation could be simpler: Including Resolution in the menus could halt the awkward, finger-stretching acrobatic routines you'll need to change image size. I'd also welcome a better sans-menu method of changing the resolution.

Auto-mode shots were dark, but that is not a concern if you use the manual settings. These

include four metering modes (256-segment Matrix, Center-weighted, Spot, and AF Spot), Shutter-priority, Aperture-priority, Exposure Compensation, Auto-exposure Bracketing, 10 aperture settings, five ISO-equivalent settings, three programmable User Sets, and a maximum exposure time of five minutes.

Most Nikons would have no serious competitors in a macro-mode contest; the Coolpix 5000 is another winner. A close-up of my keyboard showed the keys' bumpy texture, small bits of dust, and even the thickness of the letters' paint.

Nikon cameras generally take incredible shots and offer unrivaled control. With the exception of auto-mode, this camera is no exception. Learning to use all the features takes a while, but if you have a little know-how and patience, you'll want to consider the Coolpix 5000. ▲



### Coolpix 5000

\$1,099

Nikon

(800) 645-6689

(631) 547-4200

[www.nikonusa.com](http://www.nikonusa.com)



by Kylee Dickey

## Pentax Optio 430

The 4-megapixel Pentax Optio 430 is designed for those who want a convenient, portable camera. At just 2.3 inches high x 3.6 inches wide x 1.2 inches deep, the camera easily slips into a pocket.

Despite its size, the camera's stainless steel case is sturdy. The camera bundles USB and video cables, a 16MB CompactFlash Type I card, a D-LI2 proprietary Li-Ion rechargeable battery, and a battery charger. A camera this size almost requires a special, tiny, short-life battery, such as the D-LI2. Still, a portable camera shouldn't constantly suffer downtime while recharging the battery. The optional AC adapter might be a solution.

The camera's Playback mode includes zoom and pan functions. Although panning is a little slow, it's a useful feature, helping you assess image quality on the small 1.6-inch TFT LCD. Histogram and Exposure displays assist in correcting lighting problems.

The Optio 430's several modes and controls include AF Free, which lets you select a focus area. I'm thrilled that the Movie mode

allows zooming.

Unfortunately there's no option to record sound. The Multi-Exposure mode lets you superimpose one image over another. The Optio 430's strangest feature, though, is the alarm clock, which might be useful for travelers, assuming the battery holds out during photo sessions.

Images I took weren't very sharp, becoming fuzzy and pixelated quickly as I enlarged them. This surprised me, given the camera's 4-megapixel ability. On the other hand, colors were gorgeous and extremely accurate.

For a 4-megapixel camera, I wasn't impressed with this camera's image quality. I also wish the battery lasted longer. However, compared to some mini cameras out there, the Optio 430 is a decent camera with accurate image colors and a long list of manual controls not usually found on such a tiny camera. ▲



### Optio 430

\$799

Pentax

(800) 877-0155

(303) 799-8000

[www.pentax.com](http://www.pentax.com)



by Kylee Dickey



## Maxtor Personal Storage 3000XT 160GB



### Personal Storage 3000XT 160GB

\$399.95

Maxtor

(800) 262-9867

(408) 432-1700

www.maxtor.com



There's no mystery about which hard drive is inside Maxtor's new Personal Storage 3000XT external IEEE 1394 drive. The only 160GB drive in town right now is Maxtor's DiamondMax D540X.

I've waxed rhapsodic elsewhere about this EIDE drive's incredible amount of storage, so I'll spare you here.

Users of Mac OS 8.6 or later can add this \$399.95 unit to their FireWire-equipped systems, as can those running Windows 98SE/Me/2000/XP. The 3000XT has a 2MB buffer, predictably, but its nonoperating, 2ms shock tolerance (250G) and idle acoustic rating (33dB) aren't quite as good as the bare 160GB drive's specs (300G, 30dB). The 3000XT has a daisy-chain port and a one year warranty.

HD Tach 2.61 gave us good benchmarking results on the 3000XT. So with the internal 160GB Maxtor's test results in hand, I could compare the two to show you what

kind of performance penalty the external version carries.

This FireWire Maxtor gave up about 3MBps to 9MBps to the internal version. It had an average read rate of 26.4MBps (28.5MBps maximum) and an average write rate of 13.7MBps (17.9MBps maximum). These data rates are still more than fast enough for video editing, of course, which may prove to be this external drive's forte. Winbench99 showed drops of about 2MBps and 10MBps, respectively, in its Business Disk (3,380KBps) and High-End Disk tests (9,290KBps). Random-access time also took a 6ms dive to 21ms. Our test system has a 600MHz Pentium III-EB, 128MB of SDRAM, WinMe, and a Siig PCI Firewire card.

What all this means is that the Personal Storage 3000XT isn't extra server space, but it's fine for backup duty, digital artwork, music collections, and lots of video. ▲

by Marty Sems

## Yamaha Spyder 12X/8X/24X USB 2.0



### Spyder 1 X/8X/ 24X USB 2.0

\$299.99

Yamaha

(714) 522-9000

www.yamaha.com



Yamaha's new external USB 2.0 CD-RW drive is called the CRW70, or Spyder. It's an attractive 12X/8X/24X model that also decodes MP3 files, so it doubles as a personal music player when you use its headphone jack. Together with its power adapter, the Spyder weighs 4 pounds.

This Yamaha reached its advertised read speeds in our tests, with 3,517KBps maximum and 2,648KBps average read rates. CD Tach 98 gave it a weighted average drive rating of 15.5X. The Spyder seemed to fall just short of its 12X CD-R writing and 8X CD-RW rewriting goals, though. It burned a 427MB folder to CD-R in 5:57 (minutes:seconds) and to CD-RW in 7:20. These times aren't bad, especially for an external unit. We tested it with a PC with a 600MHz Pentium III, 128MB of PC133 SDRAM, an Adaptec USB 2.0 adapter, and Windows Me.

The Spyder didn't escape the bite of the external drive bug, though. We wouldn't accept its high 147ms random-access or 397ms

full-stroke access times from any internal unit. Also, the Spyder doesn't have room for batteries, which limits its appeal as a personal jukebox. In addition, our demo unit's headphone volume control didn't work.

Like other USB 2.0 devices, the Spyder is backward-compatible with USB 1.1 ports. Note that a USB 1.1 interface will seriously slow the drive down (to 4X writing), so it's definitely worth it to upgrade your notebook with a USB 2.0 PC Card if possible. Check this Yamaha's system requirements for OS and hardware compatibility with USB 2.0.

The Spyder comes with Yamaha's SafeBurn buffer underrun prevention technology. It also comes with Ahead's Nero Burning ROM 5.5, Adobe PhotoDeluxe 4.0, MusicMatch Jukebox 6.0, and other software. For instance, Mac users will also get Photoshop LE 5.0, which is a nice bonus. ▲

by Marty Sems



## ATI All-In-Wonder Radeon 8500DV

ATI's previous versions of the All-In-Wonder graphics card combined fast 3-D graphics with a TV tuner and the ability to capture graphics from an analog source. The latest version of this card, the All-In-Wonder Radeon 8500DV, adds IEEE 1394 ports, the ability to pause and record live TV, and a wireless remote control to the TV tuner and video capture abilities.

The Radeon 8500DV uses ATI's Radeon 8500 GPU, which is very nearly as powerful as NVIDIA's highly regarded GeForce3 Ti 500 GPU. The Radeon 8500DV has 64MB of DDR-SDRAM and a fast 400MHz RAMDAC. As you'd expect, the card supports OpenGL and DirectX and includes the same support for the SmartShader, Truform, and Smoothvision technologies found in the original version of the Radeon 8500 video card. The Radeon 8500DV has a maximum resolution of 2,048 x 1,536, and available refresh rates are from 85Hz to

200Hz. The video card is compatible with the Win98/Me/2000/XP OSes.

The card isn't just for play; it's a workhorse, too. Its overall SYSmark-2001 score was 147, with an Office Productivity score of 108 and a Content Creation score of 201. These scores are only a notch above average, but the Radeon poured it on during the 3-D tests. The card had a frame rate of 195fps at a resolution of 800 x 600 in our Quake III test. The frame rate dipped to 179.8fps when I increased the resolution to 1,024 x 768. At a resolution of 1,600 x 1,200, the frame rate sank to 95.3fps, but that's still good considering the high resolution. The Radeon 8500DV's 3Dmark2001 score of 6,832 is excellent.

This card is for the user who wants a little bit of everything: powerful 3-D graphics, video capture, and a TV tuner that'll double as a PVR. ▲

by Michael Sweet



### All-In-Wonder Radeon 8500DV

\$399.99

ATI

(905) 882-2600

www.ati.com



## iiyama Vision Master Pro 511

If you like supporting the underdog, little-known iiyama is one to root for. With headquarters in Japan, iiyama has proven itself and become a top name in European and Japanese markets. In the past year, the company has released a handful of top-quality CRT monitors that are beginning to grab attention in North America.

The Vision Master Pro 511 is one of those top-quality CRTs. Its 22-inch (20-inch viewable) screen has a 0.25mm dot pitch and accommodates resolutions up to 1,920 x 1,440. I tested the 511 at the recommended settings: 1,280 x 1,024 resolution and 85Hz refresh rate.

The monitor checked out fine during tests for screen uniformity, overscan, grayscale balance, high contrast streaking, and screen regulation. In diagnostics, the monitor exhibited surprisingly little defocusing for a monitor of this size tested at this resolution.

Focus and resolution matrices looked great, and all the color scales (even the color saturation scales) appeared rich and vibrant. There

were no moiré effects whatsoever. The 511 left a little to be desired during the test for video bandwidth: The monitor has a video bandwidth index of 90 (out of 100), which isn't bad, but the thinnest black and white lines on the test screens looked more gray than they should have.

A testament to the 511's powers of precision, the monitor displayed razor-sharp text at every font, size, and color combination. Oddly, though, application windows didn't quite look as sharp as possible. The monitor redeemed itself when displaying high-resolution images in Adobe Photoshop; colors looked vivid and on key, and every detail looked clear.

The 511's \$735 price tag seems cost prohibitive, but I found a few Web retailers selling the monitor for considerably less. ▲

by Cal Clinchard



### Vision Master Pro 511

\$735

iiyama

(800) 394-4335

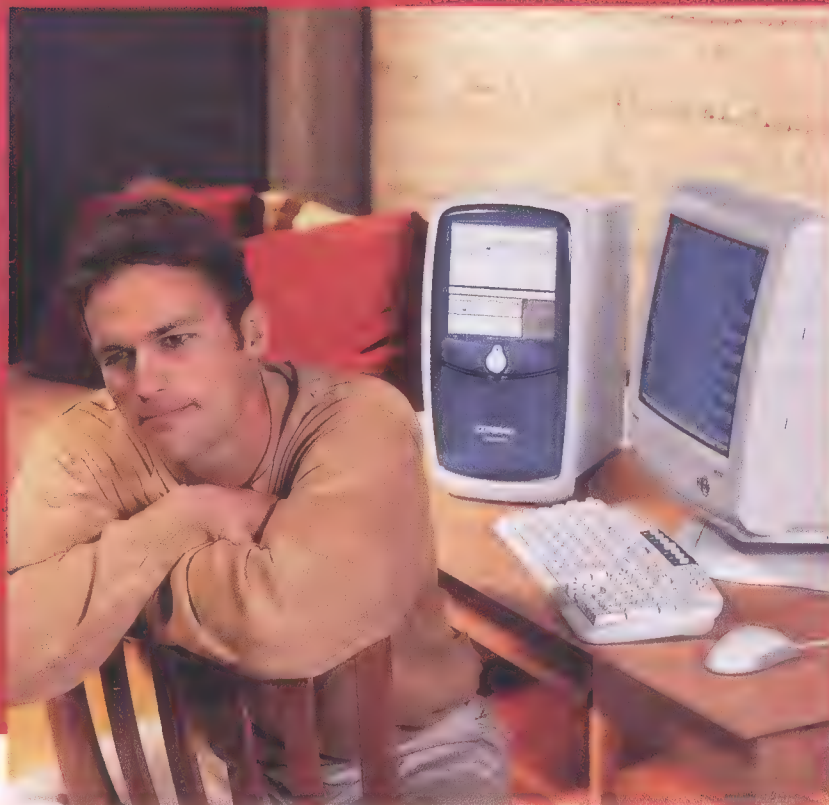
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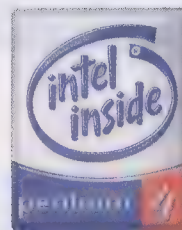
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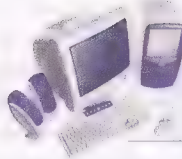
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 56K ITU V.90 Modem<sup>4</sup>  
 Integrated 10/100 Network Interface Card  
 Soundmax II Digital Audio  
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## Imation RipGO!



### RipGO!

\$399

Imation

(888) 466-3456

(651) 704-4000

www.imation.com



**R**ipGO! is the tiniest CD-R burner on the market and Imation's latest treat for gadget-happy digital audiophiles. The 8-ounce RipGO! is fun and easy to use, nice to look at, and best of all, captures and plays audio beautifully. Taking it out of its box transported me to the days of the first-generation Sony

Walkman's solid stainless steel casing and headphones well-suited to full, rich audio playback.

The RipGO! has fairly modest system requirements for burning discs from a computer. It works with Windows 98SE/Me/2000/XP and Mac OS 9.1 or higher. Key requirements include 32MB of RAM (64MB recommended), 25MB free hard drive space, and a USB port.

I hooked it up to a PC with a 667MHz Pentium III processor and 192MB of RAM, running WinXP. Interaction between the OS and the RipGO! was flawless. The device

burned 35MB of music files (about a single CD's worth of tunes) to mini CD-R in 2:25 (minutes:seconds).

The RipGO! records at 600KBps (4X) and plays MP3s and CDDAs. And because it's designed to be cozy with WinXP, it also supports Microsoft's WMA files. Mini CDs hold about 185MB, or three hours of MP3s or six hours of WMAs.

I obviously couldn't test the RipGO! for months to see how well the battery pack holds up with a lot of use and repeated recharging, but if you buy the device, I recommend using the power adapter for burning. Ripping two mini CDs ate through better than half a recharge. According to Imation, a fully charged battery provides five hours of playback, which seems accurate.

If I had \$400 to buy a new toy this month, the RipGO! would be it. ▲

by Cal Clinchard

## Hercules 3D Prophet II Titanium



### 3D Prophet II Titanium

\$149.99

Hercules

(877) 484-5536

(514) 279-9960

www.hercules.com



**H**ercules has several video cards based on NVIDIA's GeForce Titanium chipsets, with the 3D Prophet II Titanium video card being the most economical model. Although it doesn't pack as much punch as a GeForce3 video card, it is an improvement over earlier GeForce2 cards and is relatively inexpensive.

The 3D Prophet II Titanium uses an NVIDIA GeForce2 Titanium GPU, which is a fast chip for the money. The card has 64MB of DDR-SDRAM and a 350MHz RAMDAC, which is common for a GeForce video card. The card supports OpenGL and DirectX, of course, and has a wide range of refresh rates, from 60Hz to 240Hz. The video card works with Win98/NT 4.0/Me/2000/XP.

The 3D Prophet II Titanium runs 2-D applications, as well as high-performance 3-D chores. The 3D Prophet II Titanium's

Overall SYSmark2001 score was 147. The Office Productivity score was 107, and the Content Creation score was 201, which is pretty impressive. I was also impressed with the card's overall 3-D performance. In our Quake III test, the card managed a speedy frame rate of 181.8 at a resolution of 800 x 600. The resolution dropped to 131.2fps at a resolution of 1,024 x 768, although that's still a very good frame rate. The card lost steam after this point, however. I increased the resolution to 1,600 x 1,200 and the frame rate plummeted to 54.9fps. The video card's 3Dmark2001 score of 4,531 is excellent for a video card in this price range, however.

Users who want faster graphics, yet want to save a few shillings, will find the Hercules 3D Prophet II Titanium a good compromise. You won't run every game at the highest graphics settings, but you'll still get good results. ▲

by Michael Sweet



## Canon CanoScan D1250U2F

We got a hands-on learning experience about USB 2.0's benefits testing the CanoScan D1250U2F. By mistake, we first ran our trials using a USB 1.1 port. After realizing our blunder, we switched to USB 2.0 and saw marked improvement in scanning speed—speed that will enlighten many users to USB 2.0's considerable advantages.

That fast connection is this Canon's most remarkable capability. The scanner's spec sheet is pretty standard otherwise, with 1,200 x 2,400 optical resolution and 48-bit internal color capability compacted into a handsome 2.8-inch high x 10.1-inch wide x 18.1-inch deep case. The Z-lid Expansion Top lets you scan oversized items, and unlike some others, this scanner isn't powered through USB. You power up with an included AC power supply.

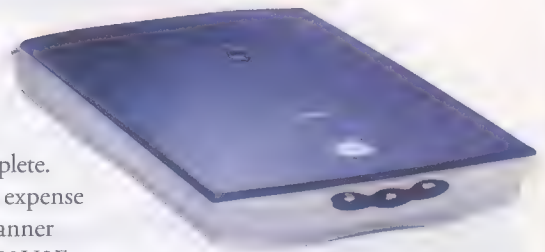
At a low resolution (150dpi and 300dpi), our USB 2.0 tests barely detected a difference compared to USB 1.1 results. At 600dpi and

1,200 dpi, though, USB 2.0's speed sparkled, cutting times by 50%. Even our most complex (and huge) 47MB photo took less than 7 minutes to complete.

Of course, speed can't work at the expense of quality. To Canon's credit, this scanner produces excellent images. The D1250U2F had an average score of about 23 on our grayscale test, and colors, even those buried deep in the background of our test photos, were multishaded and smooth.

Canon provided enough software to make your job of breaking in this scanner an easy one. ScanGear Toolbox 3.1, ArcSoft Photobase, Scansoft OmniPage Pro, and Canon Photo Record are all helpful tools for digital imaging. This scanner's quick pace may be overkill for home apps, but for a busy small office, it fills the bill. ▲

by Nathan Chandler



### CanoScan D1250U2F

\$199  
Canon  
(800) 652-2666  
(714) 438-3000  
[www.usa.canon.com](http://www.usa.canon.com)



## ViewSonic VB50HRTV

If you want a taste of high-resolution imaging power but aren't inclined to plunk down the cash for an HDTV, consider ViewSonic's VB50HRTV to view high-resolution television via a PC display. This type of device is becoming popular because it doesn't require a special video card or software and it's relatively inexpensive.

The VB50HRTV package (VB stands for ViewBox) includes everything you need to get started: in/out VGA cable, audio cable, A/V cable, power supply, remote control with batteries, and a users manual. The manual is thorough and illustrates the many possible configurations using the device.

I used a VGA cable to attach the device to a Hitachi LCD, and the picture quality was quite good. The VB50HRTV has ports for antenna/cable, audio in/out, video input, S-Video input, and RGB in/out. The multiple ports, included accessories, small size, and remote control make the device friendly right out of the box.

The standard RCA audio/video input and S-Video ports make it easy to attach a DVD player, VCR, handheld camera, or video game for viewing on a PC display. To extend ordinary viewing without disrupting the usual cable-to-VCR-to-TV configuration, insert a coaxial cable splitter into the configuration and watch different programming simultaneously—one program on the TV, another on the PC display.

You can use the device top or a remote control to change the input source. The device handles a maximum 1,024 x 768 resolution and 24-bit color.

On the LCD I used for testing, I established the proper settings before attaching the VB50HRTV and further adjustments weren't necessary. Nevertheless, the device lets you control picture settings (brightness, contrast, saturation, sharpness, hue) and sound settings (volume, treble, bass, mono/stereo/SAP, and reset). ▲

by Cal Clinchard



### VB50HRTV

\$129  
ViewSonic  
(800) 888-8583  
(909) 869-7976  
[www.viewsonic.com](http://www.viewsonic.com)





## JMTek USBDrive 128MB



### USBDrive 128MB

\$99.95

JMTek

(253) 952-7000

www.usbdrive.com



The USBDrive 128MB from JMTek is just what you should expect in a USB flash memory gadget, and it's attractively priced at \$99.95. The USBDrive comes with a neck strap, an LED that indicates drive activity, and a USB 1.1 extension cable.

Windows Me/2000/XP should automatically support the USBDrive without asking you for drivers. You can also use the USBDrive with Windows 98 SE with a driver from the included CD or with Mac OS 8.6 and later or Linux 2.4. Subjectively speaking, the USBDrive doesn't have the seductive lines of the Q Drive or even the EasyDisk, but some users may prefer its perky, man-on-the-street microphone motif. Another feature I like is its tiny li'l write-protect switch, although you'll need a needle and good eyesight to toggle it.

I timed a torturous 100MB folder transfer to the USBDrive using a WinXP PC. The drive took 13:12 (minutes:seconds; about

126KBps) to write the folder, which is in the same ballpark of speed as my old parallel port Zip 100MB. JMTek says the drive can write up to 600KBps or 800KBps, well within USB 1.1's specs. This may take the wind out of the USB 2.0 version's sails, due in March. Until faster flash memory comes along, I'm not sure if a quantum leap in interface bandwidth is going to help the USBDrive (or any other solid-state storage gadget, for that matter).

USBDrives currently range from 16MB (\$29.95) to 1GB (\$599.95). JMTek says 2GB and even waterproof versions of the USBDrive are on the way. Perhaps a waterproof USBDrive might go hand-in-hand with those underwater digital cameras I've seen lately. Then again, perhaps it's not intended for scuba diving, but for the sweatier users among us.

In short, this is a very nice USB storage gadget, especially considering its price. ▲

by Marty Sems

## Panasonic e-wear SV-SD80 SD Audio Player



### e-wear SV-SD80 SD Audio Player

\$329.95

Panasonic

(800) 211-7262

www.panasonic.com



In the world of digital music, things just keep getting smaller and smaller. When I got my first look at the Panasonic e-wear SV-SD80 SD Audio Player, I hoped I wouldn't lose it. At just 1.75 inches high x 1.69 inches wide x .69 inches deep, the e-wear is tiny.

To get the tunes going, I loaded the Panasonic Media Manager, which includes RealJukebox, onto my computer from the included CD-ROM.

You can download music from the Internet or rip it from CDs into RealJukebox and then transfer it to the e-wear's 64MB SD (Secure Digital) Memory Card through a USB reader/writer. The SD Memory Card will store around 122 minutes of music if ripped at 64Kbps or about 85 minutes if ripped at 96Kbps with AAC (Advanced Audio Coding), which is an audio compression format that offers high-quality audio but takes up less storage space. The e-wear can also play MP3s and WMA files; to play the WMA files, however, you'll need to

download the update to the software that comes with the player.

The SV-SD80's \$329.95 price includes many accessories. A rechargeable NiMH battery, charger, and AC adapter are the player's main power source. After I charged the battery to its full capacity, the e-wear played for about 18 hours. A battery-carrying case with a belt clip, which doubles as a power-extension unit, is also included. Put a AAA alkaline battery in this case and combine that with the rechargeable battery and you should get 50 hours of playback time, according to Panasonic. If you're afraid you'll lose the player, use the included Velcro armband and neck lanyard.

The SV-SD80 manages to offer CD-quality sound despite its small size. But the 64MB of storage space the e-wear offers is quite a bit less than the 128MB similarly priced products that other companies offer. Still, the e-wear impresses with its LCD and long battery life. ▲

by Jennifer Seeman



## Compex NetPassage 16 Broadband Internet Gateway

This should drive the editors nuts. I'll put my conclusion first: The NetPassage 16 from Compex is flexible and full of advanced features, yet reasonably priced.

It's a gateway router, a 4-port 10/100Mbps switch, and a wireless access point when you add an 802.11b PC Card to its single built-in slot. We installed a Compex WavePort WL11-U card in the NetPassage and enjoyed near-11Mbps transfers among a Gateway Solo 9550xl, an HP Pavilion zt1170, and an HP Omnibook xt6050. Connected to a DS-3 broadband connection, we watched very good full-screen streaming video across a 120-pace distance in our building.

The NetPassage also includes a NAT fire-wall and an IP filtering feature that blocks sites and restricts Internet access by time of day. Cooler still, it can combine a cable and ADSL connection for more bandwidth.

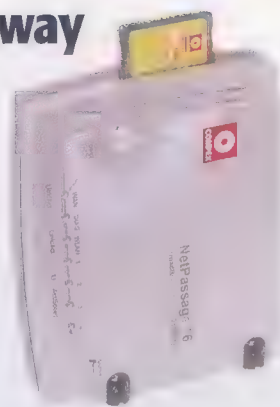
802.11b security in any device is still a work in progress, but the NetPassage16 does its part

with 64-bit and 128-bit WEP encryption. The router also has what Compex calls a Pseudo-VLAN feature, which adds even more protection for one or more wireless nodes in the WLAN. The NetPassage can connect its wired or wireless nodes to another LAN via 802.11b, opening all sorts of possibilities.

Unfortunately, the users manual is a bit skimpy for such a full-featured gadget. Novices may not be able to easily implement some of the NetPassage's advanced features. One of our lab testers remarked that the more comprehensive reviewer's guide should be the manual instead.

The NetPassage retails for \$169 or less, but some stores sell it bundled with a WLAN card for \$159. It really does deserve a second look at [www.cpx.com](http://www.cpx.com), as I've only had room to hit on some of its highlights here. ▲

by Marty Sems



### NetPassage 16 Broadband Internet Gateway

\$169

Compex

(800) 279-8891

(714) 630-7302

[www.cpx.com](http://www.cpx.com)



## IBM Infoprint 1116 .....

IBM's Infoprint 1116 costs only a little more than some of the lowest-priced laser printers on the market. For some users, spending the extra money will be worth the extra features and the faster print speeds.

The Infoprint 1116 has a 133MHz RISC processor, 8MB of built-in RAM (which you can upgrade to 72MB), and a plethora of fonts (75 scalable PostScript, 75 scalable PCL, 39 scalable PPDS, 2 PCL bit map, and 5 PPDS bit map). Unlike laser printers that cost just a bit less, this printer has both parallel and USB ports and supports an optional Ethernet interface.

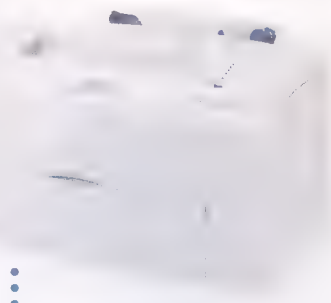
How does the Infoprint 1116 actually hold up in real-life situations? To test the printer's speed, I set the resolution at the lowest setting: 300 x 300 dpi and fed the printer a 10-page text file. The print rate was a speedy 13.3ppm, but quality suffered, especially on bold text, which had choppy, jagged edges. Switching to the default resolution of 600 x 600 dpi produced smoother text, but it was still a little jagged around the edges. Charts and graphics

had some banding and somewhat blotchy blacks. The addition of graphics didn't slow down the printer much, though. The six-page text-and-graphics file printed at 12ppm, and a three-page PowerPoint file had a speed of 9ppm.

I wouldn't suggest this printer for high-resolution graphics because the blacks were slightly uneven, and the grays were patterned. However, because there were no slices in the image and because of the sub-\$450 price tag, this printer would suffice if you needed an occasional rough copy of a hi-res image.

With a sub-\$450 price tag, you shouldn't expect perfect quality with this printer. However, the text is perfectly legible, and graphics are decent, making the Infoprint 1116 a decent consideration if you're after an affordable laser with optional Ethernet and fast print rates. ▲

by Kylee Dickey



### Infoprint 1116

\$426

IBM

(888) 746-7426

(404) 238-1234

[www.ibm.com](http://www.ibm.com)





## Dell Inspiron 2600



### Inspiron 2600

\$1,332

Dell

(800) 999-3355

(512) 338-4400

www.dell.com



Features

**Processor:**  
1GHz Pentium  
III-M

**RAM:**  
128MB/512MB

**Display:** 14.1-  
inch SXGA TFT

**Weight**  
(pounds): 6.8

**Hard Drive:**  
20GB

**Optical Drive:**  
DVD-ROM

**Connectivity:** Modem;  
Ethernet

**Final Word:** Similar to the SmartStep 100N but offers a few more extras including Ethernet, DVD-ROM, and support for Intel's SpeedStep. A solid package for the price.

The Inspiron 2600 provides a bridge between Dell's inexpensive SmartStep model and its more expensive high-end models by offering some of the amenities missing from the SmartStep, while maintaining an attractive price.

**Specifications.** Users can order a 2600 with a 1.06GHz mobile Celeron processor or a Pentium III-M processor running at 1GHz or 1.13GHz.

The mobile Celeron seems to be a decent performer, but it lacks support for Intel's SpeedStep technology. Our unit came with a 1GHz Pentium III-M processor and 128MB of PC133 SDRAM (the 2600 supports up to 512MB of SDRAM).

The 20GB hard drive our unit came with is a little on the small side, but it should provide plenty of room for most mobile users. If 20GB seems too small, you can order a 2600 with a 30GB or 40GB hard drive. Our 2600 arrived with an integrated DVD-ROM drive, but a CD-RW drive or DVD/CD-RW combo drive is available. The 2600 includes an integrated floppy drive for transferring small files.

The Ethernet port on the 2600 provides broadband and LAN connectivity, while a V.92 modem provides more traditional dial-up access. A single Type I or Type II PC Card slot lets you add additional peripherals.

The built-in graphics processor in the Intel 830MG motherboard uses shared system memory. Intel's DVMT (Dynamic Video Memory Technology) dynamically reallocates the amount of system memory the video controller uses. Instead of sectioning off a specific preset amount of system memory for the graphics controller, DVMT can deliver the optimal amount of video memory, depending on the application.

**Design.** DVMT certainly didn't limit DVD playback. The system was able to handle DVD video without any pauses or stutters. Video looked good on the 14.1-inch XGA TFT display included with our model (a 15.1-inch TFT display is also available). The 1,024 x 768 resolution is low compared to displays higher-end models offer, but it should be good enough for most users. Images and text look sharp and color was decent.

Although DVD video looked good, the 2600's speakers couldn't deliver the sound quality I like to hear from a DVD movie. Sound was thin and tinny, but the 2600 doesn't lose too many points because few notebooks are really equipped to provide good sound.

The 2600 isn't much to listen to, and it's not much to look at either. Although the case does nothing to make this notebook stand out from the competition, it does do a decent job of protecting the delicate internal components and an especially good job of protecting the TFT display.

Finally, we come to the notebook's keyboard (a component no writer overlooks). The keyboard was decent, but I had some issues with the layout. Cursor control keys, such as PAGE UP and PAGE DOWN, are to the right of ENTER and BACKSPACE, plus the WINDOWS key is in the upper-right corner rather than its typical home near the Spacebar.

**Performance.** The Inspiron 2600 delivered the performance numbers I expected to see from a 1GHz PIII-M system. SYSmark2001 returned scores of 108 in Internet Content Creation, 121 in Office Productivity, and an Overall score of 114. This is right in step with other 1GHz systems, including the Inspiron 8100 and Acer TravelMate 740.

Because Video 2000 is incompatible with Windows XP, we couldn't run our multimedia benchmark. Typically, we see lower multimedia performance when shared system memory is used, but it's unclear how Intel's DVMT technology might impact performance. As I noted above, the solution seemed quite capable of handling DVD video, at the very least.

**Final word.** A few months ago, Dell might have put the Inspiron 2600 in a pretty case, given it a better video chip, and sold it as a high-end system. With new video chipsets and the mobile Pentium 4 chips coming to market, however, the Inspiron 2600 is now packaged as a moderately priced desktop replacement. Although the 2600 likely won't be able to compete with the performance offered by the mobile Pentium 4 processors, it is still an attractive solution for users on a tight budget. ▲

by Chad Denton

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



# Gateway 700XL

There are undoubtedly folks partying with a higher-performance system up in the penthouse suite, but on the next-to-the-top floor, Gateway 700XL users are getting down with one of the best mainstream desktop systems available today. I classified the 700XL as an entertainment system because it handles 3-D gaming and DVD capabilities well, but the 700XL offers something (speed, power, ease of use) for everyone.

**Specifications.** The 700XL has a 2.2GHz Pentium 4 processor with a 400MHz bus speed. The model I tested had 1GB of RAM, but by the time you read this it will have a still bountiful 512MB of RAM and the upgrade to 1GB will run \$360. The 700XL features an over-the-top 120GB Western Digital Caviar hard drive that revs up to 7,200rpm. The system comes with the friendly WinXP Home Edition, a multimedia keyboard, and a Gateway-branded optical wheel mouse.

Gateway loaded the 700XL with more multimedia power than many users will know what to do with. The system includes an ATI Radeon 8500 4X AGP video card with 64MB DDR-SDRAM, a nifty TV tuner, and DVI support. These features are ideal for the FDP 1810 hybrid (analog/digital) 18.1-inch LCD monitor, which looked awesome during all tests. The monitor is super sharp at its maximum 1,280 x 1,024 resolution, but users requiring more real estate will have to go with a different monitor, one that ratchets up to 1,600 x 1,200 or so.

For sound, the 700XL package features a five-piece Boston Acoustics set, including a subwoofer that's approximately as large as a minitower system. Inside, the 700XL has a Creative Labs Sound Blaster Live! sound card. When it's time to connect to the Internet via dial-up or broadband connection, the 700XL is ready with a 56Kbps modem and an Intel PRO/100 VE 10/100 Ethernet adapter.

I was delighted Gateway went with Lite-On's LTR-24102B for a CD drive. This is an efficient 24X/10X/40X CD-RW drive that uses SmartBurn technology to prevent buffer underrun errors. Gateway made an equally good choice when it picked the Matsushita LF-D311 DVD-R/RAM drive for DVD playing, video authoring, and DVD-RAM storage.

DVD-R/RAM drives typically require a processor that clocks at least 1GHz and a hard drive with a minimum of 5GB available space; for this, the 700XL easily fills the bill.

**Design.** I liked the 700XL's easy-access midtower case and appreciated the roominess inside. However, most slots are taken; the system includes five PCI slots (two of which are available from the get-go) and one AGP slot (that the video card occupies). Sadly, there are only two 5.25-inch drive bays, which the CD-RW and DVD-R/RAM drives occupy; but three (out of five total) 3.5-inch drive bays are available.

The Gateway designers were apparently USB-happy when they built the 700XL: Although the system has just one serial port and one parallel port, it has three zippy IEEE 1394 ports, two USB 1.1 ports, and four USB 2.0 ports. Of all the available ports, the two 1.1 USB ports and one of the IEEE 1394 are located up front.

**Performance.** I had high expectations for the 700XL's benchmarks, and the system didn't let me down. The overall SYSMark2001 score was a lofty 218. The Office Productivity score was 197, and the Internet Content Creation score was 241. These are all excellent scores, as is the 8,292 score the system achieved during the 3DMark2001 benchmark.

I tried out the DVD drive by playing a few chapters from "The Matrix." Jumping from chapter 1 to chapter 25 didn't faze the DVD drive a bit. Using the CD-RW drive, I played a few rounds of Quake III. During DVD viewing and Quake III game playing, the images were fluid and picture quality was crystal clear.

**Final word.** At \$2,999, the 700XL probably isn't in the average guy's price range, but the system has enough to please an entire household. The flat-panel monitor eliminates the footprint a CRT monitor would otherwise leave, and (thanks to the Radeon 8500 video card) doubles as a television. For a system that does it all without costing five grand, check this one out. ▲

by Cal Clinchard



## 700XL

\$2,999

Gateway

(800) 846-4208

(605) 232-2000

www.gateway.com



## Processor:

2.2GHz  
Pentium 4

**RAM:** 512MB  
RDRAM

**Hard Drive:**  
120GB

**Optical Drive:**  
CD-RW; DVD-  
RW/RAM

**Connectivity:**  
Modem;  
Ethernet

**Chassis:** Midtower

**Monitor:** 18.1-inch  
Gateway FDP1810 LCD

**System Use:**  
Entertainment

**Final Word:** A high  
performance system with  
something for everybody.



## CPU Wars Heat Up: Dueling Roadmaps



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune. His site—[www.anandtech.com](http://www.anandtech.com)—receives more than 55 million page views and is read by more than 2 million readers per month.

It's always nice being the first on the block with the newest gear, and as obsessed techheads, we are by far the guiltiest of this. Whether it comes down to buying the new Motorola v60t although your cell phone works perfectly fine, or upgrading to a GeForce4 even though you don't *really* play games, it happens. The worst consequences of all are those painful times when you plop down your hard earned cash and the next day a cheaper, better alternative is already out.

When it comes to CPU upgrades, I'll do my best to save you, as this month I'm bringing you AMD and Intel roadmaps for the rest of this year. Gather 'round as it's going to be an interesting tale.

On the first day of CeBIT, AMD released its Athlon XP 2100+, the last Athlon XP using the 0.18-micron Palomino core. As the last Palomino-based Athlon XP, this will be the one Athlon XP to avoid. If you must upgrade now, purchase the Athlon XP that gives you the most bang for your buck (generally three or four models below the flagship, e.g. 1700+ or 1800+). The reason I say this is because shortly AMD will be releasing its 0.13-micron Thoroughbred-based Athlon XP processors. These CPUs will run at higher clock speeds and will run a lot cooler.

The Thoroughbred should take AMD into the latter half of this year where AMD *may* introduce a separate core codenamed Barton (built using AMD's 0.13-micron Silicon on Insulator transistors—learn about what SOI is here: <http://www.anandtech.com/cpu/showdoc.html?i=1469&p=13>). Finally, the next-generation Athlon based on AMD's ClawHammer will replace the Thoroughbred at the top of the desktop market. While AMD insists on a Q4 2002 launch for ClawHammer, you probably shouldn't expect widespread availability and reasonable prices until Q1 2003.

My upgrade path of choice would be a lower-end Athlon XP today and moving up to a mid-range Thoroughbred based Athlon XP by Q3. Next, depending on pricing, performance, and availability, I would consider the ClawHammer in Q4, but most likely hold off on that until 2003.

On the Intel side of things, the Pentium 4 is due to hit one more major speed bump before gaining the 533MHz FSB I talked about in March's issue. The 533MHz FSB may be met with the introduction of PC1066 RDRAM, which would pair the 4.2GBps FSB with an equally equipped 4.2GBps memory bus. If you want to upgrade to a Pentium 4, the time will definitely be this summer after the move to a 533MHz FSB.

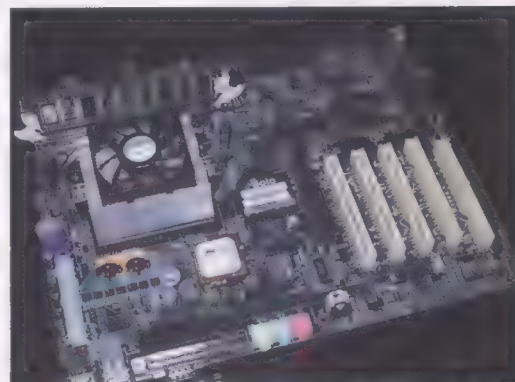
Other than faster FSB frequencies, you won't see any significant changes to Intel's desktop CPU line until the second half of 2003 when Intel introduces the Prescott core. Not only will Prescott be based on Intel's 0.09-micron manufacturing process (90nm),

but it will also feature some architectural improvements, more cache, and Hyper-Threading enabled by default (also mentioned in my March column).

My Pentium 4 upgrade path would be to go for a higher-end 533MHz FSB CPU this year and then wait until Prescott in '03. There you have it, folks, hopefully that's enough to keep you from kicking yourself for upgrading at the wrong time this year. ■

Talk to the expert at [Anand@cpumag.com](mailto:Anand@cpumag.com).

**If you want to upgrade to a Pentium 4, the time will definitely be this summer after the move to a 533MHz FSB.**



The Solo reference board from AMD was running the world's first demonstration of AMD's 8th-generation ClawHammer CPU. For more information on Hammer, be sure to read my in-depth analysis of its architecture on AnandTech.com.



## Marketing Cack

It's no secret that I'm not from around here. I've got this accent, which translates into some odd lingo here and there. Normally, I don't mind being misunderstood, but recently I've found myself often using the terms "marketing cack" or "marketing tosh" when doing reviews/previews of upcoming technology, and I definitely don't want to leave you in the dark. I want you folks to understand that marketing cack is something of which to be aware as well as beware. Tech companies are using this age-old tactic to send analysts (and journalists) into head-scratching sessions and ultimately to confuse you, the unsuspecting end user.

As a press lackey, I get to see it misused in PowerPoint slides with fancy graphs that proclaim "Our next product is 50 times faster than our last generation and wipes the floor with any of our competitors as long as you enable this feature and turn off that one, run this benchmark which we've optimized for, test on a different platform because that's all we have in our labs right now, and clock down the speed of that product because we can't actually find one on the market that is clocked at that speed." And it gets better too. "Check out this really cool graph that shows our 3-D card to be so far ahead of the competition." As long as you don't start the Y-axis at zero, eh, pillock?

Let me explain. Just about every company has done it at one time or another. S3 claimed its product had T&L, even listed it on the box. 3dfx' Voodoo3 product was really more of a Banshee2. ATI is not immune to sending out a review unit with clock speeds that aren't exactly representative of the shipping product. Bitboys Oy has become a master without ever releasing a product (now that's dedication to marketing cack). And now NVIDIA, never one to miss out, has taken a poop in the marketing kitty litter box with its naming of the GeForce4 MX.

The GeForce4 Ti series is based on the newest NVIDIA NV25 chip, while the GeForce4 MX series isn't. Nor is it an NV20. It uses the NV17 and hence is not a true DX8-class chip. Go into a

store and see new GF4 boards and last year's GF3 boards, side-by-side and guess which is more suitable for you. That's the problem: Unless you do some homework, you do have to guess. Any GF4 MX might sound "newer/better" but the GF3 Ti 500 is actually more future proof and truly DX8-compliant with programmable pixel and vertex shaders. John Carmack's recent plan critique comes to mind: "Do not buy a GeForce4 MX for Doom III. NVIDIA has really made a mess of the naming conventions here. I expected GF4 to be the speed bumped GF3, but calling the NV17 GF4 MX really sucks." There you have it, marketing cack backlash which actually hurts the GF4 MX even though it's still a very fast and cost effective product in its own right. If you don't need a fully DX8-compliant card, are more into the multimonitor nView support, and want to play today's games fast, the GF4 MX is a pretty good bet. But NVIDIA's GF4 Ti 4200 (using the NV25) is priced at only \$199 and makes the most sense if you're cost conscious but still want a DX8 part.

To stay ahead of the marketing game, scout the Web for white papers or check with sites famed for chewing on and spitting out marketing cack, like hardocp.com. Perhaps read up on some industry trade shows like IDF, WinHEC or SIGGRAPH, especially the sessions where Engineers can still be Engineers and just talk shop honestly. I'm not saying marketing is the root of all evil. Sometimes it isn't even obtrusive and can be funny to boot. For example, at the GF4 launch, I learned that four NV25s harbor more processing power than all the Voodoo1 chips ever sold. To quote an infamous Gateway marketing line, "Moo!" At a time when technological innovation and performance deltas are tighter than ever, it's no surprise that marketing has really become a determinant between success and failure. But we don't have to like it. . . . ■

*Netburst me at sharky@cpumag.com and tell me about your curling broom skills.*

*It's no surprise that marketing has really become a determinant between success and failure. But we don't have to like it.*

*Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/labuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.*



# When A GeForce4 Isn't A GeForce4



Kyle Bennett is editor-in-chief of HardOCP.com ([hardocp.com](http://hardocp.com)), one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the Net.

**T**here are lies, damn lies, and then there are benchmarks. Notice nobody tells you what comes after that? Well I will. Marketing comes next. Of course you never hear anyone talking about the treachery of marketing in our industry. Know why? Because the PR guys control much of what you hear. Yes, not only do our elected politicians have spinmeisters, so do hardware and technology companies. And they are spinning big webs in hope that your wallet will be the next thing that's tangled within their reach.

Let's cut through some of the BS you're undoubtedly being pelted with now, starting with NVIDIA. NVIDIA has totally changed gears on how its products are being marketed with the release of the GeForce4 GPU. Has it had you a bit confused? I know for a fact that we've talked to manufacturers building GeForce4 cards that are confused about what the GPU really is, so don't feel bad if you don't understand, as you're not alone.

The GeForce4 comes in MX and Titanium flavors, with three models in each series. That's six new mainstream SKUs for a single manufacturer if it builds the entire video card lineup. While the MX cards are aimed at the lower- and mid-level markets, the Ti series starts at the sub-\$200 mark and works its way up to the \$399 price point.

Now here's the big kicker that's eluding many folks: The GF4 MX and GF4 Ti aren't even based on the same chipset! Does the headline of this column make sense now? The GF4 MX is based on what's called the NV17 core, while the GF4 Ti is based on what is codenamed the NV25 core. Now add to the picture that all GeForce3 video cards were based on the NV20 core. So, if you laid these out on a line graph, you'd have a different flavor GF4 on each side of the GeForce3. That can't be right, can it? How can you make a GF4 with a "lesser" core than the GF3? I have been asking myself the same thing for weeks now and have yet to come up with an answer.

To give you some sort of explanation on this NVIDIA issue, the GF4MX is based on an uber souped-up GeForce2 NVIDIA Shading Rasterizer

technology, while the GF4 Ti is like having two pimped-out GF3s on one video card. While we [HardOCP.com] wholeheartedly suggest any avid gamers add the GF4 Ti to their short list, be on your best guard and make sure a GF4 MX doesn't end up in your box at all costs. If all you want to do is run office apps and possibly utilize a dual-display setup, the MX has your name all over it.

NVIDIA isn't the only one playing the marketing game. Many RAM manufacturers are abusing the system as well. For those of you who have already made the jump to DDR-SDRAM, you're most likely familiar with "PC2100" specification RAM. PC2100 is DDR RAM that runs at a 266MHz DDR bus and is theoretically capable of generating 2.1GB/second of memory bandwidth.

Now, with the advent of SiS, Ali, and VIA producing DDR333 qualified chipsets for mainboards, you'll be seeing PC2700, or 333MHz DDR RAM, for sale. That only makes sense, right?

Well of course it does, as that's the only way we can utilize these new chipsets. There's just one snag here: JEDEC ([www.jedec.org](http://www.jedec.org)), the organization that sets DDR standards, has yet to officially agree on any specs for PC2700. Anybody you see selling PC2700 DDR RAM or DDR333MHz RAM is sort of pulling a fast one. It's quite possible that their RAM has been tested to run at 333MHz but it's simply overclocked PC2100 specification or even maybe something else. Quite honestly, I bet most sellers don't know the spec their memory is built on.

While many will be pleased that the sticks perform at 333MHz, don't expect the same signal integrity and stability you'll see out of a true stick of PC2700 when the spec is finally adopted.

Be smart, be aware, and don't always believe the hype, or even what's written on the package. Check out [hardocp.com](http://hardocp.com) for full articles on GF4 and the new KT333 chipset. ■

**Let's cut through  
some of the BS you're  
undoubtedly being  
pelted with now,  
starting with  
NVIDIA.**

You can talk with Kyle at [kyle@cpumag.com](mailto:kyle@cpumag.com).





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Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the **Cheapest Linux Machine.**

## Samit

Building the cheapest Linux machine was a challenge for the Insidious One (that's me). It's tough for me to build a cheap PC. OK, not difficult, but challenging. Cheap PCs are not in my DNA; I have a fascination for overpowered, high-end, 3-D rigs that can also heat my apartment in the winter months when the coal runs out. There's a price to pay to own the latest and greatest (and that's sometimes suffering through early adopter tech hell).

This month's PC Challenge was an interesting proposition. And let's not forget: A lower-priced PC would equal more coal [heat] for my chilly Nebraska apartment. Price shopping was paramount, so I scouted the local papers and the Web for pieces and parts to build the cheapest PC I could live with at home. My primary focus for this machine was to toy with Linux and download files from message boards and so on. These files would be moved to another system on my network and written to CD-R. The beauty of Linux is how well it plays with low-end equipment. A good friend of mine showed off his old 486 Linux box that actually ran quite well and hadn't been rebooted in months. That was the first time I really started paying attention to Linux as an alternative to

Windoze (even though I'm much more comfortable in the world of Microsoft).

That old 486 was my role model for building this system. The key words were cheap, cost efficient, and functional. The Vega M6VCF is a Micro ATX made by Biostar with two PCI slots, one AGP slot, and built-in audio. The board is based on the VIA 694x chipset. Not fancy, but functional. The only slot I used was the PCI for my \$10 LinkSys EtherFast 10/100 card. Not bad. Popped over to [www.redhat.com/download/rhlinux72.html](http://www.redhat.com/download/rhlinux72.html), downloaded Red Hat 7.2, dumped that onto two CD-Rs, and then installed it on my \$30 CD-ROM drive. Easy as pie. (And I love pie.) The hardest part was finding the cheapest parts.

The reality of the situation is that I didn't require a CD-ROM, monitor, keyboard, or mouse. And many of you won't either. All I *really* needed to build was a system with network and video cards, hard drive, and case. I would have used a CD-ROM drive from one of my other systems to install Linux and then would have promptly removed it. My existing monitors, keyboard, and mouse could be used via my switchbox. That would have dropped my price into the very acceptable mid-\$200 range. Not a bad price to pay for a low-maintenance Linux box you can use for learning the OS and downloading/storing files. And depending on your storage requirements, you could spend some of the savings on a larger hard drive and still come in at less than \$300.



# THE PC CHA



**Samit Choudhuri**

Publication Editor  
Computer Power User

Component	Model	Price
Case	Genica GN200 ATX Mid Tower Case with 250W P/S <sup>3</sup>	\$18.95
Motherboard	Vega M6VCF Micro ATX (made by Biostar) <sup>3</sup>	\$29.50
Processor	Intel Celeron 533MHz PPGA (OEM) <sup>4</sup>	\$35
Memory	Kingston Technology PC133 128MB SDRAM <sup>2</sup>	\$29.99
Hard Drive	Western Digital WD180ABRTL 5400rpm 20GB (Retail) <sup>2</sup>	\$79.99
Video Card	ATI Xpert 98 8MB AGP (OEM) <sup>4</sup>	\$25
Sound Card	Built-in audio on motherboard	N/A
Network Card	LinkSys EtherFast 10/100 LNE100TX v5.1 <sup>1</sup>	\$9.99
Modem	N/A	N/A
CD-ROM	I/O Magic MagicSpin 56X EIDE CD-ROM <sup>5</sup>	\$29.99
Diskette	Samsung 1.44 <sup>6</sup>	\$7.99
Monitor	Envision EN-701e 17-inch CRT <sup>1</sup>	\$149.99
Speakers	CompUSA Amplified Speakers <sup>1</sup>	\$9.99
Mouse	Memorex MX4000 PS/2 <sup>2</sup>	\$6.99
Keyboard	Memorex TS1000 109-key Keyboard <sup>2</sup>	\$12.99
Software	Red Hat 7.2 downloaded and written to CD-R. (You like that, Chad?)	40 cents for two blank CD-Rs
Miscellaneous	Socket 370/Celeron/Socket A/Socket 7 Heatsink & Fan <sup>3</sup>	\$5.95
Subtotal		\$452.71
Shipping		\$31
Tax		\$12.22
Rebates	(on keyboard, monitor, hard drive, and memory)	-\$114.98
<b>Total</b>		<b>\$380.95</b>

Purchased From:

<sup>1</sup> CompUSA

<sup>2</sup> Best Buy

<sup>3</sup> Computer Geeks

<sup>4</sup> Spartan Technologies

<sup>5</sup> Office Max

<sup>6</sup> D.I.T. Corporation



# CHALLENGE

6.

**Chad Denton**

Staff Writer  
Computer Power User



## Chad

Assigning me a PC Challenge without a price restriction is like letting Microsoft write antitrust law, so Samit threatened to make me his personal PR filter if I spent more than \$1,000. There isn't enough caffeine in the world to keep me awake long enough to sort through all the buzzwords hiding in Samir's inbox, so I set a personal budget of \$750 to be safe. I didn't quite hit that mark, but at least I'm not reading the PR fluff flooding Samir's inbox.

Not having to buy a copy of Windows freed some extra cash for hardware. After building two budget boxes, I wanted hardware with a little more power. I toyed with the idea of using one of the new nForce motherboards, but Red Hat didn't have any information about the new motherboards in its hardware compatibility list (hardware.redhat.com). I found some first-hand reports on Usenet with most posters reporting problems with the integrated sound and video. So I decided on a more traditional motherboard and found a nice bundle online: a 1GHz AMD Duron, an ABIT KG-7 motherboard, and 128MB of DDR-SDRAM for less than \$200.

Next I started looking to add features on the cheap. I kept an eye on sales at my local Best Buy and CompUSA and finally found a 19-inch monitor for \$149 after a \$50 rebate. I also found an off-brand CD-RW drive

online and couldn't pass up its \$79 price. Finally, I added a GeForce2 MX graphics card for \$49. The GeForce2 is aging, but Linux isn't much of a gaming platform, and the GeForce 2 has enough 3-D might to power Tuxracer and Cannon Smash.

I did make one embarrassing mistake when ordering the modem. I was careful enough to order a hardware-based modem (most software-based modems are incompatible with Linux), but something seemed off when I tried to install the card in the all-PCI KG-7 motherboard. The circuit board was on top of the card, and the connector was too long for the PCI slot. Who knew they still made ISA cards?

Finally, I shelled out \$29.99 for a retail version of Linux Mandrake 8.1. By the time you read this, 8.1 might be a generation behind, but when we went to press, 8.2 was still in beta, and I wanted a stable OS. The retail version included manuals and some extra software, including 3-D drivers for my GeForce2 graphics card. Most of this is available for free online, but it's nice to have everything in one place. Purchasing the retail version also helps ensure money gets back to Mandrake and the open source community.

## And The Winner Is

Somehow, Linux and "cheap" seem to have been tied together like "hot dog" and "bun," and I'm not sure why. Besides being a functional, smart OS with mounds of purpose and potential, Linux's underlying foundation of "sharing" for "free" is noble and welcome in an industry dominated primarily by a goal of making a lot of grub. Then again, a \$2,000 Linux machine would probably be overkill for most.

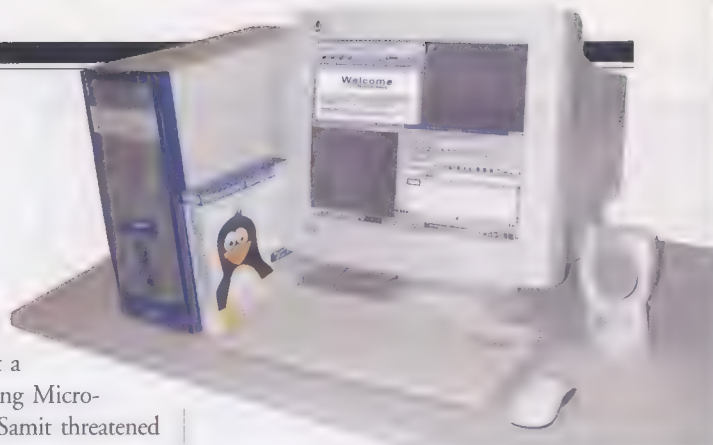
I loved Samit's approach to building his box. I've yet to meet an outright dim Linux user (can't say the same for Windows), so his assumption that most of you would-be Linuxians have spare parts lying around and know what to do with them is probably accurate. Beefing up his peewee processor and the awful monitor he found, er, bought wouldn't have killed the Insidious One, but hey. Say what you will about Samit (and we say plenty), but he's a smart cookie. He built the cheaper Linux machine. It runs nicely, and he could've done it for even less.

This is twice now I've given Chad the shaft, and I feel bad. Overall, his system is better than Samit's, and Chad knows Linux. But I can't overlook his spending \$400 more, especially when the name of this game was "Cheapest Linux Machine." And \$400 for some of you Linux souls trying to make the (computing) world a better place would buy a lot of hot dogs. —Blaine "Bossman" Flamig, content editor

Component	Model	Price
Case	Codegen 6044L (Metallic Panel /Blue Frame) <sup>1</sup>	\$45
Motherboard/Processor	ABIT KG-7 AMD 761 Chipset w/ fan, processor, and RAM <sup>1</sup>	\$196
Processor	AMD Duron 1GHz	integrated
Memory	Multiwave 128MB PC2100 Non-ECC	integrated
Hard Drive	IBM 40GB ULTRA-ATA 100 7200RPM <sup>1</sup>	\$84
Video Card	Leadtek GeForce2 MX200 32MB 4XAGP <sup>1</sup>	\$49
Sound Card	SoundBlaster Live! PCI Dolby Digital 5.1 <sup>1</sup>	\$32
Network Card	D-Link 10BT/100BTX DFE530TX+ <sup>2</sup>	\$11.95
Modem	Best Data 56K Hardware Based <sup>2</sup>	\$32.95
CD-RW	Pacific Digital 12X10X32X with Burn-Proof <sup>2</sup>	\$79.95
Diskette	Matsumi 1.44MB Floppy Drive <sup>1</sup>	\$12.90
Monitor	MAG 19-inch <sup>3</sup>	\$199.99
Speakers	Altec Lansing AVS200W 2PC Speaker System <sup>1</sup>	\$12.98
Mouse	Memorex ScrollPro Optical Mouse <sup>2</sup>	\$12.95
Keyboard	Keytronic KT800PS2US-c 104-key <sup>1</sup>	\$7.97
Software	Linux Mandrake Standard Edition <sup>3</sup>	\$29.99
Miscellaneous	18-inch IDE Cable <sup>1</sup>	\$5
Subtotal		\$812.63
Shipping		\$32.35
Tax		\$14.95
Rebate (on monitor)		-\$50
<b>Total</b>		<b>\$809.93</b>

Purchased From:

- <sup>1</sup> Mwave
- <sup>2</sup> Buy.com
- <sup>3</sup> Best Buy





# Swappin' Parts

## There's A Transformation Taking Place

**E**ach month in "Swappin' Parts," a Computer Power User writer upgrades one out-of-date component in our test machine, MERLE (Mediocre Electronic Refurbished Low-end Equipment). When we're finished, we will have transformed MERLE from a silicon trash can into a powerful system we'd be proud to put in our own homes. To date, we've upgraded MERLE's CPU, memory, sound card, speakers, video card, and optical drive.

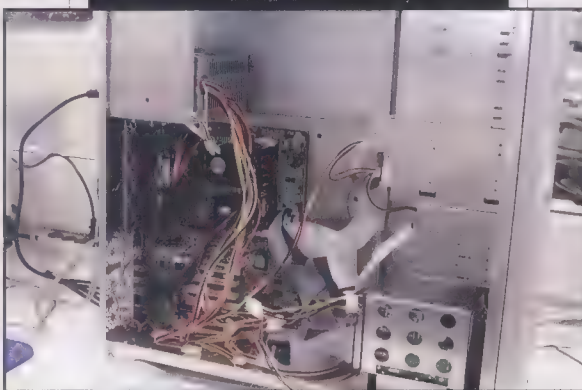
This month we're transplanting MERLE into a new case and giving him a new PSU (power supply unit). He might still have some mediocre low-end guts, but after we place his innards in a tall, cool, aluminum case, MERLE's exterior will no longer deserve the "trash can" descriptor. And although a PSU isn't exactly the most glamorous component, we'll be glad to hear MERLE humming along more quietly. This upgrade comes none too soon for our now hearing-impaired lab techs, who lately have been circling MERLE with sledgehammers.

PC case manufacturers are a proud lot and kind of like cosmetic surgeons in that they have a strong desire to dress your PC for success and enjoy showing off the latest ultra-cool (literally) materials and designs. We set our sights on an aluminum case and found several top-notch models to choose from. We considered various cases from different companies, including Cooler Master's ([www.coolermaster.com](http://www.coolermaster.com)) sweet ATC-101 and ATC-110, but in the end went with Lian Li's ([www.lian-li.com](http://www.lian-li.com)) PC-70 full tower case, which sells online for about \$195.

The PC-70 is a monster of a case with its nine 3.5-inch drive bays (three exposed, six hidden), six exposed 5.25-inch drive bays,



MERLE's abandoned case is dwarfed by his new home, a Lian Li PC-70 full tower.



There's a wealth of prime upgrade space inside MERLE's new chassis, but installing the drives close to the motherboard stretched the IDE cables.



The upgraded chassis mandated that we install the new Enermax EG465P-VE power supply toward the top of the case.

tool-free component access, and enough fans (four) and vents to expel heat from the speed demon MERLE will undoubtedly become. For a second, we thought about the PC-75, which is an identical case except for its transparent side cover. We decided we'd save about 70 bucks now and install a window ourselves later on and, what the heck, maybe throw in some neon lighting, as well.

For the current purpose, the brushed steel-looking aluminum PC-70 stands tall (23.4 inches tall, to be exact, x 8.3 inches wide x 25.2 inches deep) and provides the mellow stateliness MERLE so desperately needs. The case rests on four swiveling feet, which help keep the already rock-solid case steady when you're installing components.

Wishing nothing but the best for MERLE, we chose the Enermax ([www.enermax.com.tw](http://www.enermax.com.tw)) EG465P-VE for the new PSU. The EG465P-VE is a low-noise +12v PSU that includes two (one 3-inch and one 3.5-inch) ball bearing fans for powerful cooling abilities. The PSU meets all Intel Pentium 4 and AMD Athlon requirements, switches between 110v AC and 220v DC, and costs about \$80. It's enough of a workhorse to power everything MERLE has now, and everything we intend to throw at him later on.

A colorful sleeve keeps the EG465P-VE's mass of cables in check and out of the way. Every cable in the EG465P-VE is also well marked. Both the Lian Li case and the EG465P-VE were packed with an abundance of screws, which were



enough to accommodate our current and any imaginable future needs.

### The Case In Question

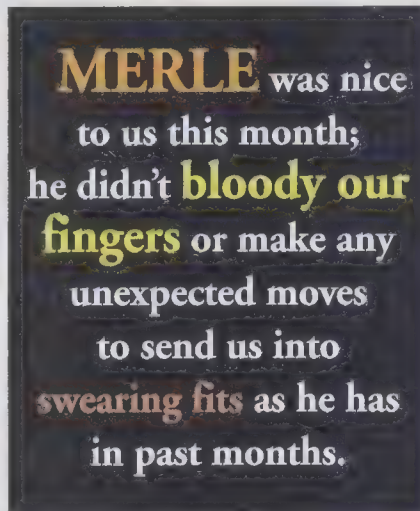
MERLE was nice to us this month; he didn't bloody our fingers or make any unexpected moves to send us into swearing fits as he has in past months. MERLE seemed cramped in his old box and apparently appreciated stretching his cables in his new digs. And what PC would complain about a new power supply and a sweat-busting set of fans? Not MERLE, at least.

We began our installation by shutting MERLE's power off; unplugging the power cord and monitor, keyboard, and mouse cables; and removing his old cover. We then determined we needed a short break, so we took one, returning later refreshed and filled with a new idea: Install the PSU first, which we did. We unscrewed the six thumbscrews from the back of the PC-70 chassis so we could remove both side covers (there were three thumbscrews on each side) and slid the EG465P-VE into the slot made for the purpose.

The only problem was that the EG465P-VE was designed to be positioned so that its intake fan points downward, and this wasn't going to work with the PC-70 because the PSU shelf had a solid bottom. No worries, though, because the PSU shelf was positioned toward the top of the chassis so that when hot air rises the EG465P-VE will suck the hottest air from the top, leaving other fans to provide more direct CPU cooling. Using two screws, the EG465P-VE fit snugly in place.

MERLE has a Biostar M7VKD motherboard, so we went to Biostar's Web site, downloaded the M7VKD manual, and printed the diagram and quick-reference pages so we could make notes as we dismantled MERLE. We began by removing the CD-ROM drive, the DVD-R drive, and the hard drive. For each drive, we disengaged the IDE and audio cables from the back of the drive and the motherboard, removed the screws holding the respective drive to its rails, and slid the drive out. We noted the proper direction for each cable so we would be able to correctly reinstall each component in the new case and then set the drives, cables, and screws aside.

We removed MERLE's old power supply cable from the motherboard's power port and all remaining cables from the motherboard's front panel header (this is where taking notes came in handiest). We removed the screws holding the video card in place and slid the video card out from the motherboard. Finally, we unscrewed the motherboard from MERLE's old chassis and moved it to the PC-70. We had to add some screw brackets (provided with the PC-70) and pop out the knockout slots to accommodate the motherboard's audio



(in/out/mic), serial, and joystick ports. We then attached the motherboard with the screws that accompanied the new case.

We plugged the new power supply into the motherboard, reattached the video card, and consulted the motherboard manual to attach the new front panel cables to the front panel header. We also used the manual to identify how to attach the cables from the USB ports on the front of the case to the USB header. Unfortunately, our motherboard only permitted us to add two of the four available USB ports.

We installed the CD and DVD drives using the old screws and cables in the lower 5.25-inch bays because the new case was too large for the IDE cables to stretch from the motherboard to the higher bays. We then attached one end of the audio connector to the CD drive and the other end to the motherboard's CD audio-in header. Finally, we installed the hard drive in one of the six internal 3.5-inch bays. We couldn't attach the two rear chassis fans to the motherboard

because there were no ports to accommodate the extra fans, but the remaining fans were enough to keep the system cool.

### All Systems Go

When we were done moving all the components into the new case, we plugged in MERLE; plugged in the monitor, keyboard, and mouse; and tested the Power and Reset buttons. Everything worked fine, indicator lights included, with one exception: MERLE couldn't find his hard drive. We powered down and checked the connection; it seems we pushed a pin out of place when we connected the IDE cable to the hard drive. We repositioned the pin, plugged in the cable, turned on the power, and MERLE was off and running.

We successfully played a DVD movie in the DVD-R drive, played an audio CD in the CD-ROM drive, and plugged in a USB keyboard and mouse into the active USB ports. Everything looked good. As usual, we ran SYSmark2001, and the scores were about the same as last month. The Internet Content Creation score was 79 (82 last month) and the Office Productivity Score was 65 (69 last month) for an Overall score of 72 (75 last month).

### Final Thoughts

This month's upgrade raised some profound questions for us. Consider the Philosophy 101 question about the refurbished boat: If you only replace a boat's mast, you still think of the boat as being the same boat, but if you slowly replace every part of the boat, in the end, is it really the same boat?

MERLE now has a new brain (CPU, memory), new eyes (video card), new ears (sound card, speakers), new skin (chassis), revitalized energy (PSU), and new entertainment center (DVD-R drive). Prior to this month, it was easy to think of MERLE as the same old MERLE, just with some new parts. But now MERLE sports an entirely new look and next month's monitor upgrade will only add to the conundrum about MERLE's identity. Are we looking at the dawn of a new MERLE, perhaps an anti-MERLE? We'll see. **CPU**

by Cal Clinchard



# X-ray Vision: DivX

If there's anything the movie-producing crowd in Hollywood likes, it's a good sequel. Check that: If there's anything Hollywood likes, it's *any* sequel, as long as it makes money. One sequel Hollywood has no interest in, though, is a slightly different take on the Napster-fueled swapping of music files: the trading of DVD movies over the Web. However, with high-speed Internet connections becoming more commonplace and with more computers equipped with DVD and CD burners, Hollywood's fears of widespread illegal swapping of DVD movies over the Web may be moving closer to reality. The addition of DivX (a digital video file compression software that we'll discuss later) to the mix has heightened those fears.

## Cracking CSS

Since the introduction of DVDs in the mid-1990s, the MPAA (Motion Picture Association of America) and movie production companies have worried about widespread piracy. Because DVD movies consist of digital bits, copies don't lose viewing quality, as do copies of videocassettes, making DVD piracy more appealing.

A few factors have worked against those looking to illegally copy movies, though. First, DVD burning hardware hasn't been easily available. Second, DVD movie files occupy several gigabytes, making it prohibitive to share them over the Web. Finally, all DVDs contain copy-protection software called CSS (Content Scrambling System) that's designed to prevent users from viewing illegal copies. CSS encrypts the digital bits that make up the DVD movie file, making them incomprehensible to hardware that isn't licensed to decrypt CSS.

However, it didn't take long for programmers to come up with ways to work around the CSS protection.

Programs such as DeCSS (see "The DeCSS Mess" timeline), SmartRipper, and qrpff strip the DVD movie of its CSS protection, making it viewable on non-CSS-licensed hardware and making copies viewable. CSS only uses

a 40-bit encryption key, which is not strong encryption, especially compared to today's standards.

Technology experts at the MPAA continue working on new technology to replace or enhance CSS, hoping to

## Doubling Up On DVD Compression

DVD file compression programs typically use two types of compression technologies to shrink a file's size: image compression, which involves shrinking the amount of data needed to represent each frame in the video, and frame compression, which involves shrinking the amount of data needed to show changes from frame to frame in the video.

### Frame Compression

Frames usually consist of 24 frames per second, which creates a huge amount of data: about 130,000 frames in a 90-minute movie. Compression programs use a combination of techniques to reduce the amount of data a movie really needs to display in each frame.

### Predicted Frame Technique

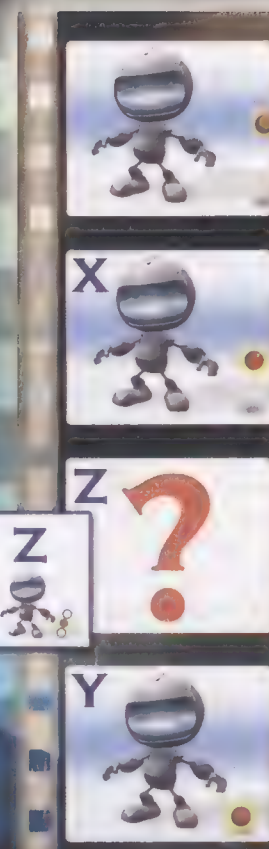
For the second frame, the compression program will store only the data showing the movement of the ball from the first to the second frame. Because the ball's movement is the only difference between frames, the compression program saves a big amount of storage space.

### Bidirectional Frame Technique

When the object moves too much for the predicted

technique to work well, the compression program uses the bidirectional frame technique. It samples image

and frame data from the frames before and after the frame in question and creates the most reasonable facsimile of the frame in question from the data.



$$(X + Y) / 2 = Z$$





settle on a technology by the end of 2002 that can thwart copying while remaining usable for general consumers. One type of technology the MPAA may use involves including a watermark inside the DVD's digital data. The watermark would alert the DVD player hardware as to whether the current disc was an original or an illegal copy.

### Move Over, MP3

Obviously, even without CSS or watermark protection, swapping DVD files, usually consisting of 4.7GB,

over the Internet is difficult. Most users don't have DVD burners and don't have the patience to wait for a tedious file download over the Internet. That's where DivX comes in.

DivX, based on MPEG-4, is a file compression utility that can shrink a DVD movie file by about 70% to 90% while only suffering a minimal loss of quality. DivX eventually could do for movies what MP3 has done for songs. Although passing a 650MB DivX file across the Web would still be a tedious challenge, this compression technology

does make the swapping of movie files at least a possibility. And underground sites featuring pirated DVD/DivX movies alongside pirated MP3 songs are growing in popularity on the Web.

The fact that DivX can compress a DVD file to about 650MB is also important because burnable CDs hold about 650MB of data. Users armed with DivX and software that works around CSS theoretically could burn movies onto relatively cheap CDs an unlimited number of times.

### Defining DivX

DivX uses a variety of compression methods to shrink digital video files, including standard image compression techniques, predicted frame techniques, and bidirectional frame techniques. DivX often drops a 30fps video file to 24fps. It uses many of the same techniques used in MP3 file compression to shrink the audio file portion of the video file, as well.

DivX's capabilities go beyond compressing pirated DVD movies. Independent filmmakers, for example, can use the software to distribute their noncopyrighted work over the Internet. Some industry experts expect that many aspects of DivX will eventually find their way into a standard for digital television, too.

### The Burning Question

Although some might question the legality of software such as DivX, simply owning a copy of DivX isn't illegal, just like owning MP3-ripping software isn't illegal. Using DivX to compress and make copies of copyrighted DVD files is illegal, though.

You can be sure that DivX isn't going away anytime soon, no matter how unhappy about it some members of the MPAA might be. With additional tools appearing that are making the possibility of DVD file sharing a reality, deciding whether to use DivX for legal or illegal purposes will ultimately be up to the honesty of each consumer. **CPU**

by Kyle Schurman

## Image Compression

Within each frame, compression programs look for areas of redundancy in color. They then can combine the bits describing those areas, lowering the overall amount of space needed to store the frame. In some instances, a compression program might eliminate an unnecessary bit, sampling the other bits surrounding it when decompressing the image to determine the missing bit. These processes are similar to the image-compression formats used for common types of graphics files, such as JPEG and GIF.

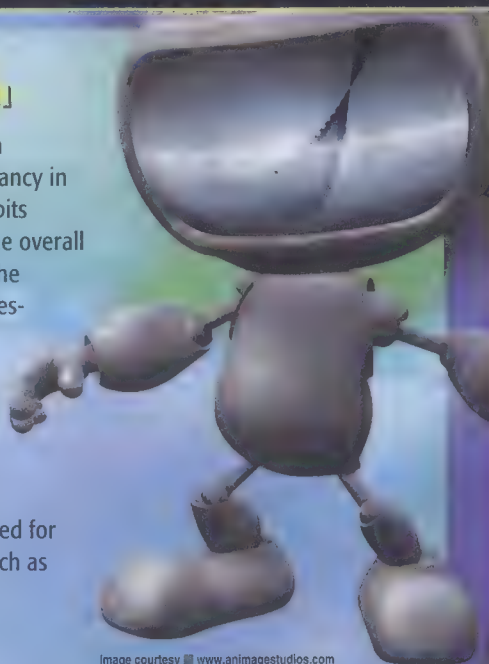


Image courtesy of www.animagestudios.com



Because all of these bits are the same color, the compression program can save storage space by marking the whole area as a redundant color.



## DivX Explained

DivX started as an underground project to design a compression technology for video—and for pirated movies. Although DivX remains the compression software of choice for people who pirate movies, it has gained some industry support as the technology has matured. The DivXNetworks developed and owns the DivX compression technology, and it says the software also can provide support for video-on-demand services and for people who create independent, noncopyrighted films.

Still, DivX has no peer among those who are trading pirated DVD files at underground Web sites. Its ability to compress digital video files by an incredibly high percentage without losing a significant amount of quality makes it very popular.

To use DivX, you first must have a digital video file, such as you'd find on a DVD.

## Circuit City's DIVX

DivX shares only a name with DIVX, a failed DVD-like technology from Circuit City from the late 1990s. The idea behind DIVX was to sell DVD-like discs at a discount. The user could play the DIVX disc for a limited time, but any subsequent viewings required an additional fee—similar to a pay-per-use format. DIVX also required a special player. However, DVD technology won out over DIVX. The developers of DivX named their technology after DIVX as a spoof. The original version name of the DivX technology included a smiley emoticon, making it DivX); to emphasize the spoof.

## Converting A Movie File To DivX

Once a movie is put on a DVD, CSS is added to the DVD. CSS scrambles the DVD's contents using encryption keys. CSS starts with the original DVD file, which is based on MPEG-2. (DivX is based on MPEG-4.) CSS creates an algorithm for transforming the DVD data. This scrambles the data in a basic manner. CSS follows by applying keys to the data. The key works with the algorithm by twisting it, causing the data to become further scrambled.

Anyone trying to decipher the data would need to know both the original algorithm and the key to decipher the data. Encrypted data can use a large number of keys, which limits the ability of a hacker using a brute-force method of decryption to easily guess the key. CSS only used 40 keys (40-bit encryption), making it easier for the creators of DeCSS and other similar software to crack the CSS keys.

Once you have access to a digital video file, you can run the DivX software on the file to compress it. Some programmers have created add-on software that makes the DivX software easier to use. In most cases, you simply run the DivX software or the add-on software of your choice. Then select the movie file you want to compress and click a button.

DivX runs a series of compression techniques on the file, including image compression, frame compression, and shrinking the number of frames per second from 30fps to 24fps. DivX can shrink most video files of about 4.7GB to fit on a CD.



## The DeCSS Mess

**1995** DVD technology is finalized. It's designed to give home users improved video and audio quality in movies over videotape. The introduction of digital video technology introduced the threat of DVD piracy, though, delaying the movement to DVD.

**1997** Matsushita Electric Industrial and Toshiba introduce CSS, which the motion picture studios adopt as the encryption method of choice for DVDs. Through CSS, consumers can't play DVDs on non-CSS licensed hardware and can't

make copies of DVDs. DVD movies and hardware make their debut.

**1999** Jon Johansen, a 15-year-old Norwegian, and two partners collaborate over the Internet to develop DeCSS, a decryption program that renders CSS useless. Johansen reverse-engineers a CSS-licensed DVD player to create DeCSS and posts the software on the Web. 2600: The Hacker Quarterly, a popular hacker magazine, posts links to DeCSS sites on its Web site.

**2000** The Motion Picture Association of America (MPAA) sues 2600, demanding removal of the links to DeCSS, issued on the DMCA (Digital Millennium Copyright Act) enacted in 1998 by the U.S. government. 2600 argues the DMCA is unconstitutional and questions the MPAA's definition of fair use. After a lengthy court battle, the MPAA wins in August 2000. However, DeCSS and other programs designed to break the CSS encryption remain available at various Internet sites for those users willing to spend a little time searching.



# Blue Laser Technology

## THE CHANGING LANDSCAPE OF OPTICAL DISCS

If you consider the future of lasers to be Star Wars-like blasters and other amazing weaponry, you might want to hop in your time machine because such inventions are probably still a few decades away. However, if your vision of the future for lasers includes squeezing more data onto your CDs and DVDs—about five times as much, for starters—put the time machine away. An improved laser technology, using blue laser light, is moving closer to reality for consumer devices, and it could shake up CDs and DVDs as we know them.

Several companies are racing to establish standards for blue laser usage. Although the jump from current red-laser CDs and DVDs to blue-laser discs won't be as dramatic as the leap from audio and

video tapes to optical discs, blue lasers are poised to provide the next breakthrough in digital data storage and lighting.

### The Basics Of Lasers

Laser is an acronym for light amplification by stimulated emission of radiation, but few people refer to it as anything but laser. A laser is a focused beam of light. To create the light in a laser, you run a current through a crystal, which excites the electrons in the crystal. (Some types of lasers run a current through a gas or liquid rather than a crystal.) Depending on the material used in the crystal, it emits a wavelength of light in a particular spectrum color.

The laser's diode traps the light from the crystal's electrons in the diode tube.

(The diode is the mechanism, usually shaped like a tube, where the laser light forms. Laser diodes are used in optical disc mechanisms, such as DVD drives, and laser printers because they use very little electricity.) The light waves build in intensity inside the diode before escaping out one end of the diode. The high-intensity light remains in a narrow beam as it leaves the diode, creating the laser light. Different wavelengths and intensities of laser light create different results when the laser strikes an object. Some lasers create intense heat; others create almost no heat.

The laser wavelength is the measurement of the distance between the peaks of successive light waves. Shorter wavelength measurements yield lasers toward the blue and violet spectrum. Longer wavelength measurements yield lasers toward the red spectrum. Lasers can be a variety of colors in the visible spectrum, depending on the wavelength, just like any other type of light. Unlike other types of light, a laser beam can be highly focused, allowing it to perform a variety of tasks, including cutting steel, targeting weapons, and reading or burning data on optical discs.

### The Blues

A blue laser operates in the blue range of the light spectrum, ranging from about 405nm to 470nm. Most blue laser diodes use indium gallium nitride as the material to create the laser light, although the amount of indium included in the material varies. (Some blue laser diodes use no indium.) Some manufacturers create blue LEDs (light-emitting diodes), which create light in a manner similar to lasers with silicon carbide.

Blue laser beams have a smaller spot size and are more precise than red laser beams, which lets data on blue laser optical storage discs be stored more densely. The spot size of a laser beam is

## Improving Red Lasers

Sharp and TDK, along with the Japanese National Institute of AIST (Advanced Industrial Science and Technology), announced a new technology late in 2001 that could create a 125GB to 200GB optical disc using red laser technology.

The size of the dots, or pits, on the disc are proportional to the wavelength of the laser beam when using a laser light on an optical disc. A beam with a longer wavelength leaves a larger dot because, using current technology, the laser beams directly strike the surface of the disc.

Sharp, TDK, and AIST changed the way the laser

beam strikes the disc, letting them greatly shrink the size of the dots a red laser generates. The researchers added two layers to the disc: A film layer that absorbs the laser beam and creates heat, and a registering layer that chemically reacts to the heat. By forcing the registering layer to react only at a particular temperature, the researchers were able to create the smaller dots on it by adjusting the thickness of the film layer and by adjusting the speed of the spinning disc.

A typical red laser currently in use creates a 400nm dot on an optical disc. Using this new

technique, researchers say they can shrink the red laser's dot size to about 100nm. Another advantage of this new technique is that current red laser materials would only need a slight adjustment, meaning current red laser production costs would rise only slightly. In contrast, blue lasers require new optical materials, which currently is resulting in more expensive laser devices.

The Sharp, TDK, and AIST researchers say use of this technique with a blue laser is possible, which would result in even smaller dots. Researchers hope for commercialization of their technique by 2005. ▲



## Under The Microscope

**B**y using shorter pits, thinner pits, and a thinner track pitch (or track width), a blue laser can squeeze more data onto an optical disc than the red and infrared lasers traditionally in use.



### CD

Tracks created using a 780nm to 830nm wavelength infrared laser.



### DVD

Tracks created using a 630nm to 660nm wavelength red laser.



### Blu-ray Disc

Tracks created using a 405nm wavelength blue laser.

Pit length, pit width, and track pitch (above) determine the amount of data each medium can store.

equals 1GB



CD: 650MB



DVD: 4.7GB



Blu-ray Disc: 27GB

one determining factor, along with the materials in the optical disc and the way the laser is applied to the disc, in the size of the pits the laser makes on an optical disc. Laser beams with larger spot sizes typically create larger pits than those with smaller pit sizes. Blue lasers are desirable because blue light has the shortest wavelength among visible light.

A blue laser operates at a shorter wavelength of about 405nm than a red laser at about 650nm. A nanometer (nm) is one-billionth of a meter, one-millionth of a millimeter, and one-thousandth of a micron. One inch is equal to about 25.4 million nanometers. A human hair is about 50,000nm wide.

### Blue Laser Development

Shiju Nakamura is credited with inventing the blue diode laser and blue, green, and white LEDs. Nakamura was working at Nichia Chemical Industries in Japan when he developed the blue laser in 1995. It's a technology many large corporations had been trying to develop for several years.

Nakamura had worked with LEDs and lasers for several years before tackling blue lasers in the late 1980s. Because most research at the time focused on using zinc selenide as the laser material, Nakamura decided to work with gallium nitride. He spent two years perfecting a technique for growing high-quality gallium nitride crystals, something other researchers had been unable to achieve.

Finally, Nakamura had the materials necessary to create blue LEDs, which he did in 1993. He followed with green LEDs and a blue laser diode in the next few years. He says the biggest commercial use for blue lasers should be DVD players.

### Putting Blue Lasers To Work

Blue lasers could appear in a variety of business applications, including high-density DVDs, laser printers, and lighting situations.

**HD DVDs.** HD (high-definition) DVDs using blue laser light could lead to five or six times the storage capacity possible using red laser light on a DVD. Blue laser light could create HD CDs, too.



Because blue lasers can increase the capacity of optical discs by five-fold or more, they give manufacturers a few options for their digital files. Manufacturers could choose to burn additional data onto the disc while keeping the same digital quality, potentially making CDs containing 50 to 75 songs. Manufacturers also could choose to use blue laser to increase the quality level of the video or audio recording. Keep in mind that nearly all DVDs using the MPEG-2 standard automatically contain some compression of the video file, which allows the file to fit on the disc. With an HD DVD, manufacturers could choose to use no compression on the video file, which should improve file quality.

**Light bulbs.** With green and red lasers already available, development of a blue laser would be the final piece of the laser puzzle among primary colors. By using all three colors of lasers, a researcher could create a device that would mix the laser light and create white light, which, at some point, could replace the common light bulb. If you combine red, green, and blue laser light, you can produce light with

greater brilliance and greater efficiency than currently is available with fluorescent lights.

Creating LEDs in this manner can be of particular help in areas where light bulbs are expensive and difficult to replace. An LED can burn for several times as long as a light bulb for about one-fourth the operating cost because most of the LED's energy is involved in creating light, rather than creating heat energy. Traditional light bulbs create a lot of heat along with the light.

LEDs already are used in many traffic lights, where traditional bulbs usually last less than one year, can be tough to see in sunlight, and fail suddenly. LEDs in a traffic light should last at least five years, remain highly visible in sunlight, and gradually fade in intensity rather than failing suddenly.

**Medicine.** Scientists already are experimenting with blue lasers in discovering certain types of cancer. Using an endoscope, researchers have had some success finding tumors using a blue laser light inside the patient's stomach and intestinal tract.

**Printing.** Laser printers using blue laser light would be smaller and more precise

than today's laser printers, which use red laser light. Because of blue laser light's smaller wavelength, the laser mechanism inside a printer that uses blue laser light could be smaller, leading to smaller printers. Print resolution using blue lasers would be at least double that of today's top laser printers, too; some researchers estimate resolution as sharp as 2,400dpi in a blue laser printer. Blue laser could play a role in full-color scanners and fax machines, too.

**Security.** After the terrorist attacks of Sept. 11, fears have increased over additional attacks using biological or chemical weapons. However, blue laser light causes some chemical and biological agents to give off light, even though those agents are invisible to the naked eye, which might let security screening personnel spot a biological agent during a routine search or as the agent comes through customs.

### Current Advancements

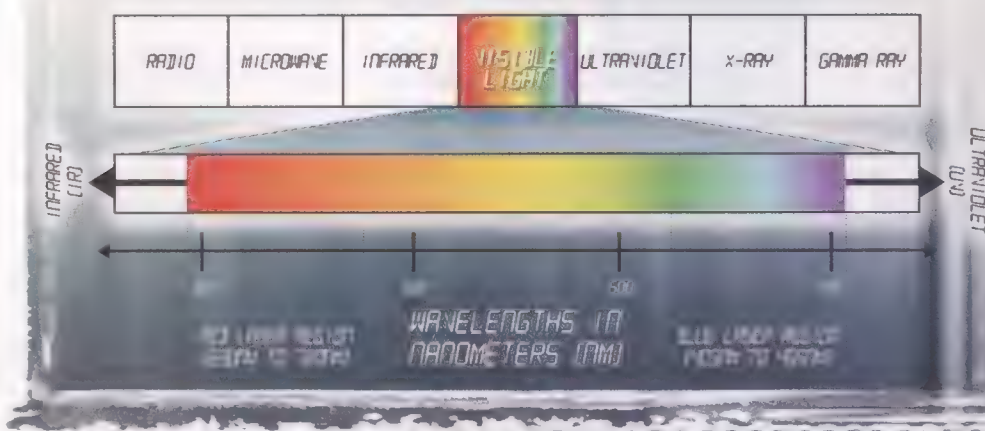
Several companies are trying to win the race to mass-produce blue laser hardware devices for consumers. Many companies have made announcements about breakthroughs in the past 12 months.

**Blu-ray Disc.** In mid-February 2002, nine international companies announced joint establishment of the Blu-ray Disc standard, which they hope will become the next generation standard format for optical disc recording. Developers say the Blu-ray Disc uses a 405nm blue laser light and holds between 23.3GB and 27GB of data on a single-sided, single-layer DVD-sized disc. Some manufacturers are working on a double-layer disc for the Blu-ray Disc standard that would permit storage of about 50GB of data. Current single-sided, single-layer DVD discs use red laser light and hold about 4.7GB of data. It's estimated that one hour of high-definition video will require about 10GB to 15GB of storage space.

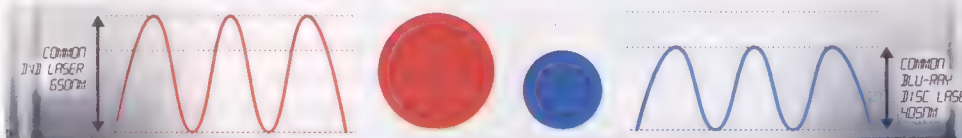
Although it's tempting to call Blu-ray Disc the next generation of DVD, those involved with the

## Wavelengths

Visible light makes up only a small portion of the spectrum. The wavelength of the light wave, measured from the top of the wave to the bottom, determines the color of the light. In a laser, the wavelength determines the type of laser and its capabilities.



A red laser, using a longer wavelength, has a larger maximum spot than a blue laser, which has a smaller wavelength but higher frequency and energy than the red laser.





standard say it's an entirely new technology. Blu-ray Disc will use a data-transfer rate of 36Mbps. Its small beam spot size allows for short pit lengths of between 160nm and 138nm. The tracking pitch for Blu-ray Disc is 320nm. The tracks on a Blu-ray Disc are less than half as wide as tracks on a DVD disc, which, along with the smaller pit size, lets the Blu-ray Disc store far more data than a DVD.

Hitachi, LG Electronics, Matsushita Electric Industrial (owner of the Panasonic brand), Pioneer, Philips, Samsung, Sharp, Sony, and Thomson Multimedia are collaborating on the Blu-ray Disc standard. By creating the Blu-ray Disc standard, the companies hope to avoid the splintering that occurred with the original DVD standards for red lasers, including DVD-RW, DVD-R, and DVD+RW.

Although those companies involved in the standard have refused to say when they expect blue laser DVD hardware products to appear on the market, hardware manufacturers should be able to begin licensing the format by the time you read this. One company spokesperson says consumers aren't too far away from seeing mass production of Blu-ray Disc hardware devices based on the Blu-ray Disc standard. Other experts think blue-laser hardware will begin appearing around the same time as high-def digital broadcasting becomes widely available, probably within the next few years. (HD digital broadcasting is currently in the earliest stages of implementation.)

The companies backing the standard say Blu-ray Disc hardware manufacturers will choose whether to include backward compatibility with current DVDs, but they expect most to include it.

**Toshiba.** Toshiba announced its own DVD disc using a blue laser in early 2002. Its disc should hold about 30GB of data per layer and per side, although the early configuration is a single-sided, single-layer disc. Toshiba would like any developments of blue-laser DVDs to remain part of the DVD Forum, which has established standards for red-laser DVDs. The DVD Forum announced in February it's going to begin looking at establishing a single format for a blue-laser DVD standard.

## Waiting For HD DVD

The unfortunate news is that all of these applications and developments concerning blue lasers remain in the earliest stages. Some of the applications we've mentioned here could take until the next decade to become commercially viable. You aren't going to be able to buy an HD DVD player for a while for several reasons.

First, blue laser devices—like most new types of technology—aren't cheap to manufacture. It took several years for red and infrared laser devices to become as easily and inexpensively manufactured as they are today; blue laser devices almost certainly will follow that trend in the next few years.

Second, the reliability and durability of blue lasers, at least when compared to red and infrared lasers, is a little shaky. The materials used to create lasers inevitably break down at some point. Although the material in red and infrared lasers, usually gallium aluminum, can last 10,000 hours or more, material in blue lasers, usually indium gallium nitride, typically lasts less than 1,000 hours. Researchers expect to iron out the problem with materials relatively soon, though. Cree claimed in February 2002 that it had created a blue laser with a 10,000-hour lifespan at room temperature. Cree also says its blue laser should be compatible with the Blu-ray Disc standard.

Third, the exacting current specifications for creating optical discs will become even more stringent to account for the smaller pits blue lasers make. Even the tiniest imperfections will be magnified in an optical disc with blue laser technology. Optical disc manufacturers will need some time to improve manufacturing processes.

Finally, consumer demand just isn't there yet. Only a fraction of the population is using DVD players or CD burners.

## The Amazing Optical Disc

If you're impressed by the ability of manufacturers to squeeze a dozen songs or an entire movie onto a flat disc you can hold in your hand, you haven't seen anything yet. Optical discs' storage capacity will grow tremendously over the next few years, thanks to next-generation laser technology.

Technology	Storage Capacity
Infrared laser for CDs	0.65GB
Red laser for DVDs (single-sided, single-layer)	4.7GB
Red laser for DVDs (double-sided, double-layer)	17GB
Blu-ray Disc blue laser (single-sided, single-layer)	23.3GB to 27GB
Toshiba blue laser DVD (single-sided, single-layer)	30GB
Blu-ray Disc blue laser (single-sided, double-layer)	50GB
Smaller red laser spot (developed by Sony and TDK)	125GB

Why would someone who's still using a VCR and videotape suddenly begin clamoring for an HD DVD? Such changes in the tastes and demands of consumers just take time.

Some experts say consumers will be wary of HD DVD, especially those who've spent hundreds or thousands of dollars switching their movie collections from videotape to DVD. Some movie studios might be wary of HD DVD initially, too, waiting for improved copy protection before adopting the new technology. (Some cynical experts say the movie studios will want to delay the switch to HD DVD to ensure they've milked every possible dollar out of the DVD market.)

Regardless of the reasons, most experts say any form of HD DVD probably is five to 10 years away from mainstream consumer acceptance. (After all, it might take consumers that long to restock their DVD-purchasing bank accounts.) You can be sure blue laser technology won't sit around waiting for consumer tastes to turn, though. Blue laser has enough potential applications available to keep researchers busy for the next several years. **COU**

by Kyle Schurman

Get The Road To Digital Entertainment Timeline and additional blue laser technology information at [www.smartcomputing.com/cpumag/may02/bluelaser](http://www.smartcomputing.com/cpumag/may02/bluelaser).



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# SECURITY, CONVENIENCE & ABUSE

## Biometrics Arrive

**N**ext time you order a Big Mac, fries, and large orange drink at the McDonald's at First and Nees in Fresno, Calif., give the clerk the finger.

McDonald's and Indivos ([www.indivos.com](http://www.indivos.com)) are experimenting with a new payment system in which patrons enroll their fingerprints with a secure computer system, linking the print to checking or credit card account information. Once done, a touch on a fingerprint scanner verifies the buyer's identity and processes the payment.

Sure, pay-by-touch is easy, but will people be able to track your movements and activities based on where you authenticate your identity? Will you be automatically lumped into the same ID databases law enforcement agencies use to catch criminals? If everything from logging into your PC to accessing your bank funds hinges on your biometric record, could someone copy your fingerprint and steal your life?

Welcome to the brave new world of biometrics.

### What Are Biometrics?

Biometric technologies are automated methods for identifying or authenticating a person based on physical attributes. Technologies include proven methods, such as fingerprint comparison and facial recognition, and fringe technologies, such as using thermal imaging to detect blood vessel patterns or Net Nanny's ([www.netnanny.com](http://www.netnanny.com)) patented process for analyzing typing idiosyncrasies.

According to a presentation by Eric J. Bowman at the Defending Cyberspace 99 conference (available at the International Biometric Industry Association's site; [www.ibia.org](http://www.ibia.org)), 15 biometric technologies were competing for market acceptance in the '90s. By the decade's end, that number had fallen to seven. Of the 145 companies specializing in the field, their biometric technologies fell into these categories: Fingerprint, 80 companies; Voice, 32 companies;

Signature, 15 companies; Face, two companies; Eye (iris/retina), three companies; Hand geometry, two companies; Keystroke dynamics, one company.

Each technology works by finding recognizable key points, such as the whorl in a fingerprint, the distance between eyes, or the distance from joint to fingertip. Algorithms use this data to create a unique template. Ideally, no two templates are identical, and you shouldn't be able to reproduce the original physical characteristics from a template. For example, even if someone stole your fingerprint template, it would be impossible to construct a fingerprint from the data.

### The Best Biometric

Despite more than a decade of development, there is little meaningful statistical information that would indicate one biometric's superiority over others. Rather than directly comparing technologies, a better approach may be asking if a given biometric solves a problem.



## NOTHING IS PERFECT

Biometrics is divided into two task groups: authentication and identification. Authentication asks: Are you who you say you are? Enrollment processes let participants enroll their physical characteristics into a biometric database in a controlled environment. With voice recognition, for example, the user enrolls using a microphone in a quiet setting, usually enunciating clearly. There's no need to build in tolerance for background noise or other poor conditions because the user will be authenticated under the same conditions time after time. Because of the controlled nature of the technologies, authentication accuracy is almost always very high.

Identification asks: Who are you? The classic example is facial recognition with crowd surveillance, now being installed at many airports. A computer tries to correlate observed attributes against a large database of potential matches. Enrollment is done under poorer conditions, perhaps based only on a few grainy, overexposed photographs. Thus, accuracy is expected to be less than perfect.

"With authentication," says Michael Ruehle, CEO of BioID ([www.bioid.com](http://www.bioid.com)), "the machine is what decides whether or not I get access to a PC or a building. However, with surveillance, you're saying there's a probability that this person might be someone in my matching database. Then the system can alert a human to take a closer look at this person. The goal of surveillance is not absolute identification; it's more to act as a red flag."

Experts cite high costs as the reason biometrics have taken so long to become popular. Today, however, very accurate fingerprint scanners, such as Digital Persona's U.are.U Personal ([www.digitalpersona.com](http://www.digitalpersona.com)) cost only \$69. PC Card-based fingerprint scanners, such as Compaq's Biometrics PC Card ([www.compaq.com](http://www.compaq.com)) cost \$179. Panasonic's iris scanning Authenticam ([www.panasonic.com](http://www.panasonic.com)) is \$239. In contrast, hand geometry scanners start at about \$2,000.

"Deciding on a particular biometric depends on many more parameters than just cost," says Prianka Chopra, an identification and security analyst with Frost & Sullivan. "One would be how much accuracy you want. If you have a very high-security area, you might want to go with iris recognition. But if it's mainly trying to be convenient for your workers, you would go for hand geometry or fingerprint for the convenience. Think of people like building workers. Their fingers are grimy, which could impair fingerprinting. All they have to do is come and place their hand on the sensor. You have to think of the work conditions, accuracy, user effort, and intrusiveness."

One way to increase security and flexibility is employing multiple biometrics simultaneously. BioID's eponymous product uses a camera to capture a 1-second video clip of the applicant. Software analyzes face, voice, and lip movement patterns simultaneously. This way, if the applicant has a swollen face or laryngitis, two out of three criteria can be enough to verify identity.

### The End Of Privacy?

Soon you'll see biometric authentication at drive-thrus, cash machines, and anywhere you buy things. "They" will be able to follow your every move, especially if biometric systems in mobile devices, from PDAs to cars, are integrated with GPS systems.

The hype from most biometrics companies is that biometrics are infallible. Airports are purchasing facial recognition systems left and right, so biometrics must be able to sniff out bad guys, right? (Has it happened yet? Umm, no.) In Hollywood, the fact that super agents are called on to ingeniously circumvent biometrics is a silent testament to how tough the technologies should be to beat.

Are biometrics that impervious? Surprisingly, yes. But that's not to say biometrics can't be beat. Sure, you could cut off someone's finger to fool a fingerprint scanner, but advanced systems check the body temperature. A more practical way to defeat first-generation fingerprint scanners was with a flashlight. Heavy oils on people's fingers would leave a latent image on a scanner's glass. The next user had to only shine a light through the glass and that was that. Today's scanners usually include a routine that makes sure the current print isn't an exact match of the previous image.

Fooling a facial recognition system is a matter of taking a snapshot of someone's face, blowing up a print, and flashing it in front of the camera. Really, this works—unless the software includes a double-checking procedure. Facial recognition systems such as Visionics' Facelt ([www.visionics.com](http://www.visionics.com)) require applicants to blink or smile. (We were unable to test whether video of a person's face could fool the software.) As with most security flaws, people can defeat a biometric because system administrators fail to enable extra security features. Processing a smile would only take two or three seconds, but some users might complain about the inconvenience.

Perhaps the largest loophole with desktop-level biometrics is the system on which they run. A fingerprint scanner on a Windows 98 machine is all but useless. Simply boot to a floppy or press ESC during Windows login to bypass the security. The problem is tougher with an NT-based system. If the biometric software includes a fallback password stored on the local machine, a cracker can use a brute force cracking application to eventually infiltrate the system. In corporate biometric systems, this often is impossible.

"In a network implementation," says BioID ([www.bioid.com](http://www.bioid.com)) CEO Michael Ruehle, "you pick your phone up, call your system administrator, and say, 'My PC camera is not working and I can't get in.' The admin goes into your user record, gives you a temporary fallback password, and then says to go to your PC and press this key combination on the keyboard. That pops up what looks like a regular login password screen. Then he says, 'OK, the password for today is ORANGE.' The administrator doesn't even have a password up until the time you call him and says you need one. And after that, the admin turns it off."

Where's the weak link here? The admin's password, of course, which means a brute force crack can still work. Control the admin's machine and you can generate any fallback password you like.

The question is whether such steps are worth the effort. No one is going to create a latex duplicate of your fingerprints or crack your PC simply to check out your Quicken files. If you're the head of a counter-intelligence organization, however, such measures may be justified. ▲



This happens already, even without biometrics. Reward cards let marketers know which groceries you take home. Much of your home ownership is public record. And, have you've seen anything in your credit card terms stating your purchasing habits *won't* be relayed to third parties? Unless you're a privacy fanatic, odds are you have a lot less privacy than you think. The question is whether biometrics will make privacy concerns substantially worse for individuals.

"The issue of privacy does not relate to biometric technologies," says Chopra. "The risk of privacy violation is really about misuse or improper use of information by the organization holding the information. Use of biometrics technologies requires specific rules and procedures to ensure who has access to the information, what the biometric would be used for, etc. Also, the use of smart cards and biometrics alleviates some of the privacy issues. This is because the biometric template is stored in a tamper resistant smart card that is owned and controlled by the individual and is not stored in a company/government central database."

Public surveillance systems may result in more serious privacy breaches. A January "Drawing a Blank" report sponsored by the ACLU (American Civil Liberties

Union; [www.aclu.org/issues/privacy/drawing\\_blank.pdf](http://www.aclu.org/issues/privacy/drawing_blank.pdf)) takes a scathing look at the lack of results from several dozen surveillance cameras the Tampa Bay police installed in 2001, ostensibly seeking to identify criminal suspects. Not only did the system fail to identify any possible perps (although false positives were made), but the Tampa Bay police also ceased using the system after less than two months, allegedly because of high user intervention, low accuracy, and lower net results. The report also relates misuses by Detroit and UK law enforcement with similar equipment watching civilians for entertainment's sake and using surveillance technology for stalking women.

It would seem a method to monitor how public and private entities use biometric information without requiring a vast bureaucracy of overseers is one solution. Meanwhile, don't be too worried about government agencies joining forces to follow your activities.

"Police can request the cellular company for details on where I've been all day," says Ruehle. "They can triangulate my signal strength from the three or so towers I'm logged into. They can request video records from the bank or the 7-11 and piece together my activities. But it's not real-time. Can the government follow people

that they don't like around the city in real-time? I would say no, and probably no for the foreseeable future. The algorithms required to do that kind of wide-area public surveillance, to be that fast and accurate enough to give a positive ID on someone walking through public spaces, it's just not going to happen."

### Biometrics Tomorrow

In the future, expect to see "quick scan" stations everywhere from grocery stores to airport check-in counters to DEQ test facilities. Biometrics will help make daily tasks more efficient and hopefully facilitate better record keeping.

Chopra expects that within five years smart card-based biometrics will be used for everything from gaining access to buildings to participating in government programs. She says the travel industry in particular will adopt biometrics for access control and identification. A recent Harris Poll revealed that 82% of those surveyed wouldn't mind undergoing fingerprint scanning at airports. The U.S. Immigration and Naturalization Service has already made preliminary moves to use biometrics along the Mexican border.

George Myers, Digital Persona's senior director of product management, anticipates that biometrics will help clamp down

## BIOMETRICS ON THE BIG SCREEN

Using a fingerprint scanner to log in to Windows may be convenient, but it's not riveting drama. Hollywood loves to glorify technology, often to ridiculous extents. The first examples of biometrics in the movies are probably from such

films as "Mission: Impossible" and "Charlie's Angels," in which the hero(ines) run a gauntlet of biometric gatekeepers to access, er, mission critical computer files.

In "Charlie's Angels," the bombshells swipe fingerprints

from a beer bottle to make latex duplicates and construct special contact lenses based on scans of an authorized user's retina.

Voice recognition might be Hollywood's favorite biometric, starting with "2001: A

Space Odyssey's" HAL 9000, which performed speech recognition and read lips. Stallone's "Demolition Man," brilliant in its use of future biometric systems, contains a terrific example of how voice recognition may eventually

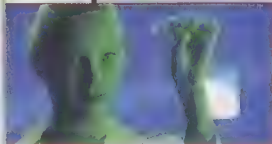
"Charlie's Angels"



"Enemy Of The State"



"Demolition Man"





on accidental and illegal gun use. "You wouldn't put biometrics in a gun, per se, but you could allow a manufacturer to make a rack for a gun wherein if you don't authenticate before you pull it off of the rack, the gun won't activate. That's fairly easy to do and easy for manufacturers to implement." Myers notes that hospitals are already implementing similar systems to restrict access to prescription drug cabinets.

Just as biometrics can secure office buildings, it can secure homes, with fingerprint locks replacing key locks. When the technology becomes cheap enough, biometric sensors can childproof cabinets in new construction. The question then becomes: With all these biometrically sealed objects in our lives can one function normally without having to authenticate at every turn? Ruehle envisions one solution.

"If I have a cell phone in my pocket that has a camera, microphone, and a Bluetooth chip, then when I register at the hotel, the hotel's system can attach to the cell phone and say, OK, this phone is an authorized authentication device to get in the door," Ruehle says. "When I want to get in my room, I look at my cell phone, say my name, then the door unlocks. Once I register my cell phone as being the authentication device for access to my network, I can use it for my car,

my home, my PC at work, whether locally or across the Internet. That phone gives me access to everything I allow."

Ruehle says you can find the ideal future biometric in "Star Trek" episodes. When the captain says "bridge," the computer knows he's authorized to go there. The ideal biometric is transparent and natural, not intrusive.

The first steps toward this have been taken. Scanners are now affordable to consumers. According to Myers, PC manufacturers will likely begin offering fingerprint readers and software as standard equipment in new systems within the next year. In 12 to 18 months, the first cars featuring biometric technologies will emerge from Japan and Germany—not primarily for security but for convenience and comfort.

If Big Brother is going to inhabit our brave new biometric world, it will likely be the same Big Brother of today. In contrast, having our homes, property, and sensitive data protected with biometrics will leave us more secure than ever. We all know the hassles and dangers of passwords, encryption, identity theft, and credit fraud. With luck, these problems will vanish with the touch of a finger and a gleam in your eye. **COU**

by William Van Winkle

## BIOMETRIC BEGINNINGS

**B**iometric identification wasn't automated until well into the 20th century, but the use of fingerprinting extends back into ancient Babylon, China, and Egypt, where fingerprints were purposefully used on clay seals and tablets.

The first Western use of fingerprint ID happened in the late 1850s. Sir William Herschel, an English chief magistrate working in India, had natives use the backs of their hands, then palms, and finally fingers, to seal contracts. The natives superstitiously felt this was more binding than a signature. When Herschel amassed enough fingerprints, he concluded that the records actually could prove or disprove identity.

In the 1870s and 1880s, British surgeon-superintendent Dr. Henry Faulds observed some of the ancient clay uses of fingerprints, recognized their significance, and devised a system for classifying them. He sent his ideas to Charles Darwin, who forwarded them to his cousin, Sir Francis Galton. He published the first official book on the subject, "Fingerprints," in 1892. In New Mexico, Gilbert Thompson of the U.S. Geological Survey was the first American to use his own fingerprint on a document to thwart forgery. In 1893, Mark Twain's "Life on the Mississippi" used fingerprints to identify a murderer.

In 1903, the New York State Prison system started fingerprinting criminals. The U.S. Army followed suit in 1905, and the FBI started in 1924. The Bureau had amassed more than 200 million fingerprint cards by 1971.

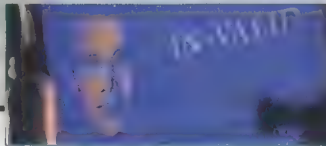
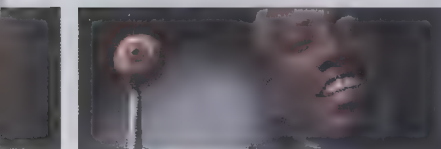
Interestingly, a common misconception persists that the first biometric practitioner was Parisian police director Alphonse Bertillon, who allegedly devised a system for ear prints during the 1880s. In actuality, Bertillon developed a system for cataloging 11 different bodily measurements, including the ear. He never made latent impressions of ears, only writing down their key measurements on a profile sheet, along with arm, feet, finger, and cranial notations. Ultimately, the much simpler methods of fingerprinting, in which the odds of two random prints matching are 67 billion to one, displaced Bertillonage. ▲

secure and personalize automobile controls. Perhaps the most thorough, realistic use of voice recognition comes from Robert Redford's "Sneakers," which only fails in its improper handling of analog vs. digital voice recordings.

After voice, iris/retinal scanning is a close second for big screen popularity, with films such as "X-Men" and "Demolition Man" (taking home the Oscar for Best Scene Featuring Biometric Circumvention) offering memorable examples.

"Gattaca" deserves special mention for its use of a biometric not yet in development: DNA. Not until the late 1990s did technology emerge using a portable computer chip to perform limited in-field DNA testing. DNA may become the most accurate biometric of all. ▲

"Gattaca"





# TECHNOLOGY

## YOU CAN USE SECURE YOUR SYSTEMS TODAY

**A**re your systems secure? Sure, your firewall protects them from hacker threats from the Internet, but have you protected against someone directly accessing your home or small-office computers? If you're just relying on passwords (hard to guess though they may be) and login names, your data isn't as safe as it could be. It's hard to verify that a user is who he claims to be with just a login/password combination.

That's where biometrics comes in. Although the recent focus on security has increased attention on biometrics, this particular field has been growing steadily for several reasons. Most importantly, biometrics provides an almost foolproof authentication method for access to restricted

areas, computer systems, and other devices that require user verification. Biometrics is also used for routine tasks, such as logging people in and out of work or recording access to a secure location.

A number of biometric products can provide another level of security for your home or small-office systems. Some of these devices are inexpensive and easy to use, while others are more elaborate, costly products designed for larger networks. You can easily implement many of them on your home or office PC for less than a couple of hundred dollars. The biometrics products we've compiled here are divided into the three main biometrics groups: visual, fingerprints, and voice and movement.

### FINGERPRINTING

Fingerprint scanning products are some of the simpler biometrics products you can use to secure your PC. They are popular because they are the least expensive of the scanning biometric systems available, but the very nature of inexpensive technology can cause problems. Although the process of fingerprint scanning tends to be fast because there is only a small area to scan, grime, dirt, and oil on the finger or scanning surface can result in invalid readings.

Also, some scanners are particular about the position of the finger: slightly off center and the scan has to be redone. This is especially true with inexpensive scanning devices. More

The SecuGen Hamster is lightweight enough to move with a notebook or sit next to a desktop PC. It is not as sensitive to light changes as some fingerprint-scanning devices.

expensive scanners tend to have bigger panels on which to place your finger, as well as better software that can compensate for finger rolling, movement, and placement.

**Identix BioTouch USB Fingerprint Reader.** The Identix BioTouch USB Fingerprint Reader (\$130; [www.identix.com](http://www.identix.com)) provides system security with the convenience of plug and play. The Fingerprint Reader also comes in a PC Card version (\$179); both versions use Identix's BioLogon software to identify fingerprint scans to grant or deny access. The Identix unit tends to be a little more light sensitive than competing units, but the accompanying software is excellent. It can compensate for finger placement and rolling to some extent, but the smallish scan area limits placement to a small sweet spot.

**Sony FIU-710.** Sony makes one of the more talented fingerprint scanners on the market for small networks and single PCs, yet at a reasonable price. The FIU-710 "Puppy" Fingerprint



The U-Match mouse from BioLink scans a person's thumbprint as he handles the mouse to provide user identification and keep unwanted users from accessing your PC.

Identification Unit (\$299; [bpgprod.sel.sony.com/bpcccontent/puppy.BPC.html#](http://bpgprod.sel.sony.com/bpcccontent/puppy.BPC.html#)) is the size of a business card and almost as thin. It connects to a computer with a USB cable, and a sensor in the card detects a finger on the panel and activates the identification process. The software bundle is excellent, although the FIU-710 doesn't handle large numbers of users.

Even better than simply scanning fingerprints, the FIU-710 uses public-key encryption to securely store fingerprint data and digital signatures. Retailing at \$299, the FIU-710 (it is commonly called "puppy" after its





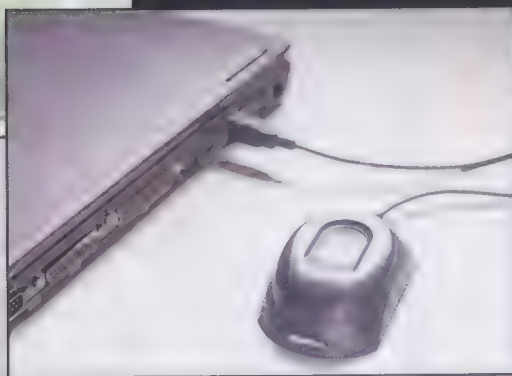
## VISUAL

Commercial eye scanning systems are especially useful in security because eye patterns are difficult to fake. And facial recognition scanners are slowly becoming more available for smaller systems. Early facial scanning systems were large, complex, and expensive. The proliferation of smaller digital cameras and Web cams has changed the facial scanner market a little, although resolution is still an issue with the less expensive systems.

**Panasonic Authenticam.** The ability to scan eyes for iris or retina patterns is still fairly rare in lower-cost devices, but a few reasonably priced units are making their way into use. The Panasonic Authenticam (\$239; [www.panasonic.com/medical\\_industrial/iris.asp](http://www.panasonic.com/medical_industrial/iris.asp)) is one such product that works to secure Windows systems and doubles as a Web cam. (The camera is combined with Iridian Technologies' iris-recognition software. You can also buy the product at [www.iriscan.com](http://www.iriscan.com).) To access a system, a user aligns her head according to blue and white guide dots in the upper window of the Authenticam, while the lower

window illuminates her eye with a red flash. The eye is then imaged with the red flash showing details of the eye. The included Secure Suite software calculates a set of parameters for the image and compares it to a database, generating an authentication message if the scan is a match. The entire process takes about 15 seconds.

**BioID SOHO.** The inexpensive BioID SOHO (\$44.95; [www.bioid.com](http://www.bioid.com)) replaces a Windows 9x/NT login system and uses a Web cam or other attached video camera to examine faces. In addition, BioID SOHO uses a microphone to add voice recognition. The \$44.95 retail price for the BioID SOHO doesn't include the camera or microphone, so keep that in mind before purchasing this product. Larger BioID systems are available for networks and servers.



The Identix BioTouch Fingerprint Reader comes in both USB (pictured here) and PCMCIA Card versions.

development code name) is not an inexpensive solution but is one of the more secure of its type and price range.

**DigitalPersona U.are.U Pro.** The DigitalPersona U.are.U Pro (\$149; [www.digitalpersona.com](http://www.digitalpersona.com)) has a larger-than-usual fingerprint-scanning surface to prevent problems that can result from trying to scan fingers that are off center. Finger placement is a major problem with many inexpensive fingerprint scanners, one that usually means the user has to scan and rescan several times. So the larger U.are.U Pro surface is a welcome feature, reducing the number of times you'll have to rescan.

Another nice feature of the U.are.U Pro is the way it handles scanned information. Some fingerprint scanners send an unencrypted data stream to the controlling

software on a computer after scanning a fingerprint. This data stream could, in theory, be intercepted, copied, and otherwise manipulated, leading to unauthorized people gaining authorization. The U.are.U Pro encrypts the scanned fingerprint information within the reader itself, then

sends the encrypted data to the controlling software on the PC. This makes it harder to spoof the system with fake data. A Personal edition of the U.are.U system for WinXP is lower priced at \$69 but doesn't have the same features as the Pro edition.

**BioLink U-Match.** For sheer convenience of use and unobtrusiveness, the BioLink U-Match (\$120; [www.biolinkusa.com](http://www.biolinkusa.com)) mouse is hard to beat. The U-Match is a slightly old design of a mouse, but it has a new twist: an optical scanner built into the side of the casing. The scanner reads a user's thumbprint as she places her hand on the mouse for use and uses that

scan to identify the user and deny or grant access to the PC. Although the U-Match mouse software is limited in functionality, the device is easy to use and simple to install and configure.

**SecuGen Hamster.** It's not a mouse, but the SecuGen Hamster looks like a mouse house. The Hamster (\$109; [www.secugen.com](http://www.secugen.com)) has a larger-than-normal fingerprint scanning area. The unit also seems to be less sensitive to light levels than many other fingerprint-scanning devices. The included SecuDesktop 2000 software is good, and there's a logging system that offers an audit trail of authorization attempts.

The Sony FIU-710 is one of the best fingerprint scanners for PCs and notebooks, although at \$299, it costs twice as much as many of its competitors.





## VOICE RECOGNITION

In theory, the only things required for a voice-identification system are a microphone and software that processes the voice and analyzes distinctive characteristics. But although they're easy to use, voice-recognition systems have a distinct disadvantage: A person's voice can change due to such factors as aging, stress, and illness, and background noise can affect the recording microphones. Some software systems can compensate for these effects, but voice recognition is still one of the less accurate biometric systems available today. In addition, high-quality digital or analog recordings can usually fool voice recognition systems, requiring them to be used with additional methods of verification for effectiveness.

**Nuance Verifier 3.0.** A few commercial voice authentication systems are available for small or home offices, although there are many voice-recognition systems used for dictation. Essentially building a unique fingerprint of a voice, though, is harder than figuring out what the voice is saying. An example of a commercial biometric voice-recognition system is the Nuance

Verifier ([www.nuance.com](http://www.nuance.com)). The system, which costs several thousands of dollars for a simple setup, employs a voice-recognition and a voice-verification stage, letting you employ random statements to avoid prerecording of a password string.

**T-Netix SpeakEZ.** Another commercial system is the SpeakEZ from T-Netix ([www.speakezinc.com](http://www.speakezinc.com)). This voice-authentication software package works with any decent-quality microphone to create a unique scan of a voice, which it uses to identify users. T-Netix offers an SDK (software developer's kit) and DDK (database developer's kit) you can incorporate into custom applications. According to the manufacturer, the system is so sensitive that it can detect such subtle changes in a voice that it can tell the difference between a live speaker and a high-quality recording of the same voice. A number of companies have licensed SpeakEZ technology for commercial products, including BioNetrix (\$100 per user; [www.bionetrix.com](http://www.bionetrix.com)) and Visionics. (See the Extreme Biometrics sidebar.)

### The Biometrics Choice

Installing biometrics systems on your existing PCs and networks is not necessarily an expensive proposition. For a home PC, you can install a simple fingerprint, facial, or voice-recognition system for less than a couple of hundred dollars. The accuracy of these systems will not rival those of expensive, more complex biometrics devices, but they are adequate for protecting your home PC. And complex biometrics systems are not necessarily out of the question for smaller networks and offices. In many cases, a few biometrics devices can service an entire network, often with a single server holding the authentication software. You can buy most of the hardware components off the shelf in a decent computer store.

If you need to keep the information on your home or small-office PCs secure, biometrics products can be a great way to do it. The level of protection you employ and the intrusiveness of the systems depends on your security requirements, but biometrics systems are now readily available and easy to work with, so they make for a great option to consider. **cpu**

by Tim Parker

## EXTREME BIOMETRICS

**P**erforming facial recognition on someone's face peering directly in to a camera is one thing, but pulling dozens of faces out of a crowd and identifying each one in close to real-time is another. That's why the two specialists in facial recognition, Viisage ([www.viisage.com](http://www.viisage.com)) and Visionics ([www.visionics.com](http://www.visionics.com)), command huge fees (hundreds of thousands of dollars) for their software.

Despite the high cost, there's no shortage of customers for the security software these companies provide. Any public event (such as the Super Bowl) is subject to scrutiny by one of these systems, as are visitors to banks, casinos, and many other public places where large gatherings of people are common.

**How did they do that?** The two companies use different approaches to facial recognition. The Visionics system measures the relative distances between specific structures on a face, such as the nose, ears, and cheekbones. Along with many other measurements, these permit a set of measurements to be produced that will be the same regardless of distance from the scanning camera or changes in makeup, contact lenses, and so on. Only surgery or obscuring parts of the face that the system measures can throw off the system. The Viisage system measures the entire face and produces a complex measurement called an eigenface, instead of simply measuring specific points on a face.

Visionics uses a technology called Facelt Face Recognition to isolate one or many faces from a larger scene, removing background clutter and isolating subjects either automatically or manually. The system can then perform one-to-one matching for authentication or one-to-many matching for identification. As the subject moves through a scene, the Visionics system can follow the face and obtain more images to confirm identification. Each face in crowd scenes can be analyzed in real-time and data on each face stored in a database. ▲





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# VISUAL BIOMETRICS

## An Eye On How These Technologies Provide Security

**S**mile for the camera, please. Now blink your eyes. Say your name, please. Thank you. Next.

This isn't a scene from a Hollywood screen test. It's actually an enrollment procedure used in many visual biometric technologies for entering an individual into a database based on his or her

unique visual characteristics. Enrollment is the first step in such biometric processes, creating a reference in the system for that individual.

The use of visually related biometrics for authentication and identification purposes is an exploding field. It's also a field that can be grouped into two primary sectors,

including retina/iris recognition and facial recognition technologies.

### Eyes Wide Open

Retinal scanning has been in use for years. Used almost exclusively for guarding access to facilities or areas where security is a concern, the technology works by using a specialized camera to look through the pupil at the blood vessels in the top layer of the retina, which consists of a nerve layer at the rear of the eye. The patterns of these blood vessels are unique to individuals, changing little during a lifetime, unlike fingerprints, which can change due to growth, scarring, and more.

Typically, a template that's less than 100 bytes in size is generated using these patterns, which are measured at more than 400 points. The small size of such templates lets standalone devices store large numbers of retina files without excessive storage demands or reliance on a central server.

The technology does have some drawbacks, however. A retinal scanning device can cost as much as \$2,500, eliminating most home and retail uses. In addition, many people find the process of undergoing retinal scans more uncomfortable than other biometric input methods. For example, an individual might have to be within a half-inch of the scanning device, keep very still, and endure a strong light that illuminates the inside of the eye. As other biometric technologies advance and become easier to use, retinal scanning has retained many of these limitations.

Iris scanning is another biometric method gaining popularity in a hurry. For biometric measurements, the iris (the colored portion of the eye surrounding the pupil) provides 266 unique points of reference within what is known as the trabecular meshwork. Like retinas, human irises are a constant biometric from before birth to death, barring external damage or degenerative disease. Unlike retinal scanning, however, devices can scan an iris from as far as three feet away, eliminating the discomfort associated with some retinal devices. In addition, a clear camera view of the iris typically doesn't require strong auxiliary lighting.

## OPEN YOUR EYES

### IRIS SCAN

Iris scans are similar to retinal scanning, except that a template is created based on details found in the iris. An individual's iris is less likely to change over time, and iris scans typically don't require as strong of light as retinal scanning does, making it a more comfortable process for users.

### RETINAL SCAN

Retinal scans are used primarily for security purposes. They are considered far less accurate than iris scans. A typical process entails shining a strong light through the pupil to create a template based on the unique structure of blood vessels on the rear interior wall of the eye.

### FACIAL SCAN

Facial recognition biometric technologies work well for authentication applications. A typical process works by analyzing an individual's face at multiple points for unique features, storing this summary data in a template. The template is stored in a database and is used as a comparison against the user in the future.



In a typical process, a scanning device acquires an image of the iris. Algorithms then divide the image into finely spaced concentric rings, which are further divided into hundreds of subsections called phasors. The phasors are then examined and their contents cataloged. Extremely complex mathematics help create a template based on this data.

Iridian Technologies ([www.iriscan.com](http://www.iriscan.com)) refers to this template as an IrisCode, which contains the location of the contents within the phasors and the phasors' location within the iris. An IrisCode (512 bytes) isn't as compact as a 96-byte retina template. However, continuing improvements and decreasing costs of computing power and data storage should eventually make the files very manageable.

Many applications use iris recognition technology (see pg. 54), including to protect a home user's PC—check out Panasonic's Authenticam (\$239; [www.panasonic.com/medical\\_industrial/iri.asp](http://www.panasonic.com/medical_industrial/iri.asp)), which is powered by embedded software from Iridian—and ultra-sensitive government facilities guarded by high-end products, such as Iridian's IrisAccess 2200.

Tom Tallerico, a research engineer at the Department of Energy's Brookhaven National Laboratory ([www.bnl.gov](http://www.bnl.gov)), has extensive experience working with biometrics. Part of his job entails deciding on the best means of providing access to secure areas at Brookhaven, such as the Relativistic Heavy Ion Collider research facility. Having worked with a variety of access-control technologies—including retinal scanning, hand geometry recognition, and iris scanning—Tallerico says users prefer the non-intrusive, no-contact-required operation of iris scanning compared to other biometric platforms.

### About Face

Facial recognition is also leading the pack of sexy technologies transitioning into mainstream reality. As with most biometrics apps, many vendors are getting their hands wet in this field, using various proprietary algorithms and techniques in their products. However, there are essentially four primary groups that

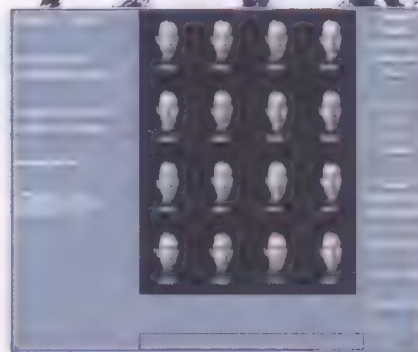
make up the underlying foundation of the various technologies.

The crudest of the four is probably AFP (Automatic Face Processing), which looks at a facial image, finds key features, and measures distances and angles between them. For example, a system might measure how far it is from the tip of the nose to the right corner of the mouth or where the eyes are in relation to other facial features. By comparing these parameters to the measurements taken of an individual, software can decide if a match is warranted.

Another facial recognition technology is eigenfaces, developed by MIT ([www.white.media.mit.edu/vismod/demos/facerec/basic.html](http://www.white.media.mit.edu/vismod/demos/facerec/basic.html)). In this process, an individual's face is compared to a database of 128 "global faces," pulling similar features, such as eyes, ears, a nose, and a mouth, from different global faces to compile a virtual composite, or eigenface. Each global face and each feature—eigeneye, eigenear, and so on—is numbered. The software notes the global face each feature was compiled from and compiles a numerical face template. As with most biometric applications, the template is used for future authentication or for verifying a person is who he claims to be or for determining a person's identity from a pool of many possibilities.

Neural Network Mapping technology looks at each feature in the enrolled face and the face of the individual seeking verification. An algorithm decides if the two features match and assigns that feature either a match or no-match designation. A goal of Neural Network Mapping is to adapt and learn in an intelligent fashion which features provide the most reliable verification or authentication possibilities for a certain face, thus improving the reliability of future operations.

The fourth technology, and the one probably used most widely, is Feature Analysis. LFA (Local Feature Analysis) is a version of this technology that Visionics ([www.visionics.com](http://www.visionics.com)) favors. Visionics produces FaceIt, a popular facial recognition product. The company recently announced a merger with Identix ([www.identix.com](http://www.identix.com)), another



Eigenface is one form of facial recognition technology in use at MIT. The process compares a user's face to 128 "global faces" in a database to make a composite out of comparable features.

major presence in the biometrics world. LFA works on the assumption that you can construct any facial image, using an "irreducible set of building elements." The template that's produced, called a faceprint, is constructed by arranging these building blocks into an image that matches the face of the person, being enrolled and then recording which block went where. The resulting file is just 84 bytes, which permits very fast manipulation during actual use.

### Put Your Best Face Forth

Facial recognition products are showing up everywhere, for authentication and identification purposes on still image and live video surveillance systems. Casinos use the technology to watch for known professional gamblers. Law enforcement agencies use it as a sentinel for known criminals. IBM's snap-on UltraPort II camera (\$99; [www.pc.ibm.com/us/thinkpad/index.html](http://www.pc.ibm.com/us/thinkpad/index.html)) for the company's X, T, and A series ThinkPad notebooks bundles Visionics' FaceIt software, which unlocks the screen saver when an authorized face appears in the field of view of the computer's camera.

Visually based biometric technologies, particularly iris scan and facial recognition, are constantly being deployed in new locations. So the next time you have that nagging feeling someone is watching you, smile for the camera. And try not to blink.



# FINGERPRINT HAND RECOGNITION

Get A Feel For These Biometric Technologies

If you've ever had the distinct pleasure of being loaded into the back of a cruiser and hauled to the county lockup, you remember with pride having your fingers pressed into ink and rolled across a 10-print card. (Even if your record is squeaky clean, you've at least seen Sipowicz haul some poor slob into the precinct for the treatment, right?). Well, that inkpad/paper card ritual is giving way in many departments to glass and silicon in the form of biometric fingerprint technology.

Law enforcement is just one area where biometric methods are being used for identification and verification purposes, but it may be the most visible. Bryan Hall, Lee County Jail administrator in Tupelo, Miss., says that jail uses Identix's TouchPrint 2000 ([www.identix.com](http://www.identix.com)) to input suspects' fingerprints into a database. TouchPrint acquires prints via an optical scanning process. No ink. No mess. Little fuss.

"I love it," Hall says. "We used to have to send in ink cards [to a state agency], and sometimes we got back as much as 70% as rejects. With this system, the rejects are around zero."

Lee County has been using the system for about two years. Hall says prints are typically stored in the computer systems of the law enforcement agency that captured them. They are also routed to a central state agency, and most prints from suspected felons are sent to the FBI. Once prints are acquired, authorities can search for matches in various databases and compare latent prints gathered at crime scenes.

## Tools Of The Trade

There are essentially three primary technologies used in electronic fingerprint recognition. Optical scanning is the most common, followed by silicon-based scanning and then ultrasound. In optical scanning, a finger or thumb is placed on a

small, flat glass or plastic plate. A light in the scanner illuminates the bottom of the finger, and a CCD captures an image of the print.

Silicon-based scanning, a method rapidly growing in use, generally entails a silicon surface acting as part of a capacitor, while the surface of the finger acts as another part. The silicon is divided into a tightly packed grid of rows and columns, with as many as 200 increments per centimeter. The device captures the nuances of the ridges and spaces on a finger with exceptional detail. Silicon sensors are showing up in a variety of computer peripherals, including Siemens' ID Mouse (\$99 to \$119; [www.siemensidmouse.com](http://www.siemensidmouse.com)). Such sensors eliminate the need for using PINs and passwords for verification and identification purposes. Simply touch the pad and you gain access to a system.

Some experts are touting ultrasound methods as the fingerprint scanning technology of the future. Ultrasound methods bombard a fingertip with acoustic waves, measuring the impedance of the finger in extremely fine detail to yield images with great resolution. Ultrasound also has a better ability to see through dirt on fingers or smudges on plates, which can cause poor readings in other recognition methods.

During the acquisition of prints, images undergo various phases of digital cleanup and sharpening. Various vendors—and there are a lot of them—have their own proprietary algorithms to handle the analysis, comparison, and verification of fingerprints. Although manual processing of fingerprint images is possible on most systems, the cleanup that takes place during the acquisition phase is internal to the system and transparent to the operator.

## Book Em', Danno

The method in which electronic fingerprints are processed depends largely on the

intended use. The methods generally fall into one of two large camps: AFIS (Automated Fingerprint Identification System) and non-AFIS. AFIS is the method law enforcement agencies use to acquire, process, store, and match fingerprints. Because of evidentiary needs, AFIS prints move through the system as intact images.

Non-AFIS fingerprints—referred to as finger-scans by the International Biometric Group ([www.biometricgroup.com](http://www.biometricgroup.com))—are handled differently after the acquisition stage, primarily in an effort to break free from the criminal stigma attached to fingerprinting. A few products work by creating vector-based maps of the ridges on a fingerprint. Most finger-scan systems, however, index prints based on unique features called minutiae.

Minutiae deal with characteristics of the ridges on a fingerprint, with ridge endings being the termination points. A ridge can divide into two ridges, known as a bifurcation. Other minutiae are known as crossover points, islands, deltas, and dots. You may also hear other characteristics used for comparisons referred to as whorls, loops, and arches.

In many systems, software algorithms find minutiae and mark their locations in reference to a map-like grid that uses x- and y-axes. Some systems mark the location of a minutiae point in relation to a fingerprint's core. Other systems set a 0,0 grid home at the bottom-left corner of a print. The information compiled for each minutiae point typically includes distance and direction from 0,0, as well as the angle at which the feature resides on the fingertip. Once a minutiae map is formed, it's stored as a template (anywhere from 200 bytes to 1,000 bytes in size). Compared to image files, authorities can search these templates at extremely high speeds. Privacy is also less of a concern here because the image is discarded and can't be reconstructed from the template.



Simply put, electronic fingerprints are well suited for both the authentication and identification of a person from a database containing scores of prints.

For example, incorporating fingerprint identification hardware and software into a device, such as a mouse or keyboard, is far more effective than requiring the use of a PIN or ID card to verify the identity of employees with access to certain computers in highly secure work environments. A common identification example is the matching of latent prints from a crime scene to those in a criminal database.

### Talk To The Hand

Although biometric fingerprint technology is in fairly wide use, it's not the only game in town. Hand geometry biometrics is also growing, mainly as a verification method. A typical process involves providing a person, such as an employee, with an ID card or PIN. Software takes dozens of precise measurements of the employee's hand, including for width, length, thickness, and surface area. From the measurements, the software creates a template.

Let's say an employee needs access to an area of a building. The user swipes an ID card or enters a PIN at the entry point. Software matches the ID or PIN to a corresponding profile in a database, which also contains the hand geometry template. The employee places his hand palm down in a device, which performs extremely quick measurements of the hand to create a profile that is compared against the template in the database. If they match, you're in. Some devices—including some at Disney entry points for season pass holders—measure two fingers instead of the entire hand.

A high-profile example of hand geometry technology is INSPASS (Immigration and Naturalization Service Passenger Accelerated Service System), in place at some major airports (see [www.ins.usdoj.gov/graphics/howdoi/inspass.htm](http://www.ins.usdoj.gov/graphics/howdoi/inspass.htm) for more information) to let frequent travelers bypass immigration lines. Another major project is known as Basel, which will use Recognition Systems' HandReader technology ([www.recogsys.com/index.shtml](http://www.recogsys.com/index.shtml)) at access points in Israel. Basel is expected to use hand geometry and facial recognition technology.

## ANATOMY OF A FINGER-SCAN

**B**elow are some of the usual steps taken in a typical process for acquiring a fingerprint using a non-AFIS (Automated Fingerprint Identification System) method.

To start, a fingerprint is scanned into a system using a device that typically utilizes an optical scanning, silicon-based, or ultrasound technology.

After the print is acquired, software marks minutiae, which are unique characteristics of a print, including ridge endings, bifurcations (ridge divisions),

crossover points, islands, deltas, and more. Algorithms are then used to locate these minutiae.

Once minutiae are identified and stored, the image is discarded, leaving behind a minutiae map that's saved as a template and one that corresponds to the person from whom the print was taken. The template can then be referenced later for various identification and verification purposes.



Because the similarity of hand geometries among some people is more common than in other biometrics, the technology isn't typically used in identification systems. However, hand geometry is reliable enough for verification tasks because a reading from a user must match the template encoded on an accompanying ID card or PIN.

Although fingerprint and hand geometry technologies continue to rapidly improve, fingerprint methods in particular is still not quite as easy to use as vendors would have us believe. The primary bottleneck is in the acquisition stage, where inconsistent operator skill, dirt, scars, and other factors often make it hard to acquire a quality print.

Still, these methods beat having your finger plopped in ink—especially if looking at five to 10.



# VOICE MOVEMENT

Biometrics That Listen & Watch What You Say

**A**s vendors of biometric applications continue their quests for the perfect authentication and identification products—be they voice or facial recognition, fingerprint or iris/retinal scanning, or hand geometry methods—individual biometrics have inherent strengths and weaknesses. One weakness is the difficulty some users have participating in particular processes. For example, someone with severe arthritis may not be able to reliably flatten a finger on a fingerprint scanner. In addition, many people are uncomfortable having a strong light beamed in their eyes, a requirement in some retinal scanning processes.

In addition to user difficulty, reliability of various methods is a primary concern. There's little to no room for error in a biometric solution that grants Johnny Laser access to a top-secret government facility housing a missile defense system.

In terms of comfort, the biometric of voice verification may be the least intrusive biometric platform in use, requiring nothing more of a user than speaking into a microphone. Voice verification differs from voice recognition in that it matches a voice to a particular user, as opposed to using a computer to translate spoken words into digital text.

## A Distinct Voice

Veritel ([www.veritelcorp.com](http://www.veritelcorp.com)) is one company offering a line of voice verification products. According to the company, the products analyze unique vocal features, such as cadence, pitch, tone, harmonics, and the shape of a user's larynx, to create a voiceprint as unique to a person as his or her fingerprints. During an enrollment process, the user is prompted to speak a certain phrase. At first glance, a graphical representation of that spoken phrase looks similar to those of other users. Upon closer examination of small areas of the speech file, however, differences are noticeable. It's these distinct patterns that represent the acoustic nuances unique to the vocal tract of one individual.

One obvious problem with voice verification is that a person's voice doesn't always sound the same. A person sounds different when they have a cold or are otherwise ill. Many people sound different in the precoffee hours. Some vendors claim their technologies take these factors into account, but we've also seen disclaimers that read something such as "If a verification attempt fails, try the verification again." Some might surmise this as being a tactical admission that the system may not be dependable enough for crucial situations.

Another potential shortcoming is the possibility of using a recording from an authorized user to grant access to the wrong person into a secure area. Some vendors insist this isn't possible because algorithms are able to decipher the

difference between a human voice and an acoustic speaker in a playback device. This may be true in most circumstances, but digital recording and playback technology are making their own advances. In light of this, some users are reluctant to bet the farm based on vendor assertions.

One way in which such risks are being mitigated is multimodal biometric technology. In this approach, authentication relies on a combination of more than one biometric measurement. BioID ([www.bioid.com](http://www.bioid.com)) is one company that uses a multimodal approach. To enroll in a typical BioID-enabled setting, the user looks into a camera and speaks his or her name several times. Three separate reference files are then created for future comparison and verification.

The first reference file is a voiceprint. The second a facial template, such as those used in facial recognition applications. The third is an analysis of how the user's lips move when he speaks his name. The lip recognition component locates the mouth by searching the image for a contrasting section of pixels in the approximate shape of a mouth. Once this portion of the image is detected, it is isolated and a set of vectors is drawn around the outline of the lips. The movements of these vectors in relation to a virtual grid are recorded, reduced to numerical values, and stored as a template.

After enrollment, requesting access to information or a location entails the user looking into the camera and speaking his name. All three parameters are compared, and access is granted or denied. The obvious benefit of a multimodal approach is that the chance of falsely confirming the wrong user on all three of these biometric measurements is miniscule.

You can experience this technology firsthand by downloading a demo version of BioID SOHO at [www.bioid.com/cgi-bin/download\\_demo.pl](http://www.bioid.com/cgi-bin/download_demo.pl). The package replaces your Windows logon procedure with the three-part verification technology described above. A camera and microphone are required to use the software.



Nuance is another company that is providing an interface between the human voice and digital data. Among the company's products is a voice authentication platform. To experience it firsthand, check out Nuance's Web site at [www.nuance.com/demos/demos.html](http://www.nuance.com/demos/demos.html).

Despite the potential problems of voice verification, the technology is already in use in many applications, from telephone access to financial transactions to protecting information against unauthorized access.

### Smart ID

The accumulation of multiple biometric factors into a single application is also appearing in biometric forms other than voice. Billing its technology as "The Smart ID Solution," Datastrip ([www.datastrip.com](http://www.datastrip.com)) provides a technology that allows multiple biometric characteristics to be encoded onto an identification card. The technology works by embedding up to 2,200 bytes of data into a barcode called 2D SUPERScript.

A key selling feature is the flexibility the technology offers a company or organization deploying the identification system. A company can include any type of data and any number of entries up to the 2,200-byte limit. For example, a Datastrip barcode on a driver's license can

contain the usual physical descriptors, such as name, address, date of birth, height, and weight, plus a fingerprint template and photograph.

The fingerprint template is an important part of the process, for it's this biometric that ensures that the person presenting the card is the person associated with that card in the enrollment database. In fact, to protect the cardholder's privacy, the 2D SUPERScript barcode can only be read—and the encoded information regenerated—after the registered cardholder supplies a fingerprint that matches the fingerprint template embedded in the barcode.

Devices and the accompanying software that are needed to read the card can be incorporated into stationary systems or purchased in a handheld solution from Datastrip called DS VERIFY2D. The device has a scanner that reads the barcode, an LCD screen to display the information, and a finger-scan pad to accept the fingerprint of the official cardholder to unlock the code. It's worth noting that this technology is designed to store a person's biometric data only on the card, which may be attractive to privacy advocates. Organizations, of course, may not be precluded from storing personal biometrics using other systems.

Chuck Lynch, Datastrip's vice president of sales and marketing, says

Datastrip's barcode technology is currently in use in a number of government applications and could start appearing on some states' driver's licenses within the next month or two. Discussions among states are being conducted under the auspices of the American Association of Motor Vehicles in an effort to develop interstate standards. Such standards are necessary for a license issued in one state to be read by equipment in another state. Lynch says there is "no other way to cost-effectively store multiple biometrics, as well as demographic information and a photograph, onto a card without using our 2D barcode. SmartCards let you do this but they're costly, \$3 to \$15 per card, and the sensors on the SmartCard tend to break over time."

In addition to driver's licenses, Lynch believes a "trusted traveler" card will at some point be necessary for air travel within the United States. Such a card could verify the identity of each passenger with a higher degree of certainty than is currently possible through the use of photographs.

It remains to be seen how a populace torn between desires for safety and privacy will embrace this or any other biometric technology once it becomes mandatory on a widespread basis. **CDU**

by Jerry Hatchett

**THE NUTS & BOLTS OF VOICE RECOGNITION BIOMETRICS**

The non-intrusive nature of voice verification makes it one of the more preferable biometric technologies. In short, more than a dozen parts of the human body—from the diaphragm to the nasal cavity—combine to form the vocal tract. Differences in the way air moves through and resonates in these components translate into a voice that is as unique to a person as her fingerprint. Voice verification algorithms isolate and memorize the subtle but unique nuances of a human voice, then verify the presence of these characteristics during workday.

**MATCH**



## The Bleeding Edge Of Software

by Warren Ernst

### Inside The World Of Betas

**F**ortune telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

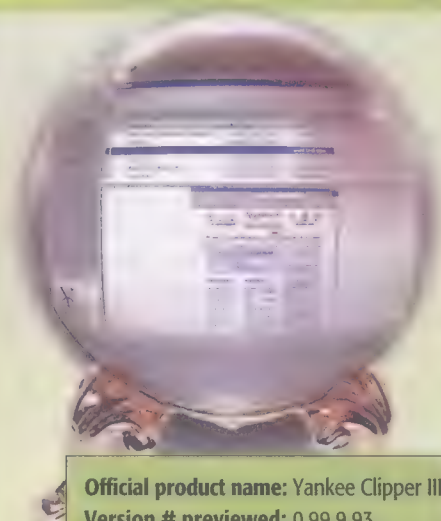
#### Yankee Clipper III 0.99.9.93 beta

**C**opying and pasting may be the greatest things since sliced bread—unless you do them a lot. Think of all the copying and pasting you do just moving information from two different programs into a third. Yankee Clipper III changes all that.

YC3 is a super clipboard, storing as many as 200 different blocks of text and as many as 20 different graphical items within an index. To get started, you launch YC3 or enable its start-with-Windows option. Then, choose Copy (or CTRL-C) from the Edit menu of any program. Then copy something else. And again. And again. When you're in the app in to which you want to paste, choose Paste (or CTRL-V). By default, YC3 pastes items in the order in which they were copied.

What makes YC3 so good is what you can do with data. YC3 keeps track of all clipboard items as a stack. Reordering the stack is as simple as dragging and dropping within YC3's intuitive Outlook-like interface. You can convert formatted text to unformatted text and URLs to plain text and even strip out characters, such as greater-than signs (>) in e-mail messages. If you want to always reorder the stack, press CTRL-ALT-V within any application and choose an item from a pop-up menu.

YC3 has yet to hit the magic 1.0 version number, but you wouldn't know it. After four weeks of strenuous use, I haven't experienced a single crash or hiccup. The app's free price tag makes it an indispensable download. ▲



**Official product name:** Yankee Clipper III  
**Version # previewed:** 0.99.9.93  
**Publisher:** Joe LeVasseur and Konrad Krupa  
**Developer and URL:** [www.yankee-clipper.net](http://www.yankee-clipper.net)  
**ETA:** Q2 2002  
**Why you should care:** The clipboard has never been more useful.

#### WinGate 5.0 Beta C

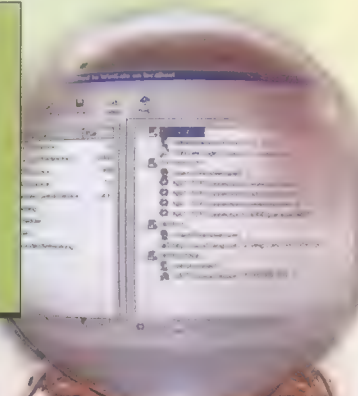
**W**inGate was the first Windows-based proxy server, and this beta is the most powerful version yet, offering features that rival professional routers/gateways and firewalls. You can also configure WinGate for simple SOHO networks with minimum fuss. Access to the program's entire feature set depends on the license code you buy, but the beta provides complete access.

Why use a Windows-based software router when Linux distros essentially do the same thing, or when you could quickly configure a cheap hardware DSL router? Because WinGate offers more features and flexibility than a hardware solution, and it uses a familiar interface and OS.

WinGate can perform NAT (Network Address Translation) or proxy-connection sharing at the same time and can act as a firewall, complete with detailed logging. WinGate also offers a DHCP server, supports VPN access, provides streaming media proxies for smoother online multimedia apps that use UDP packets, and more. In short, the feature list is very comprehensive.

WinGate's licensing schemes include Home, Standard, and Professional. The Home license is equivalent to a basic DSL router, only less expensive. Standard offers

nearly all of the logging and proxy goodies, while the Professional license essentially taps into the Windows NT4/2000 user database and security profiles. Pricing varies from \$39 to \$999, based on the number of users. The beta is free for 30 days, and though I couldn't test it under huge loads, it was stable and trouble-free in a SOHO environment. ▲



**Official product name:** WinGate  
**Version # previewed:** 5.0 Beta C  
**Publisher:** Deerfield.com  
**Developer and URL:** [www.deerfield.com/beta](http://www.deerfield.com/beta)  
**ETA:** Q2 2002  
**Why you should care:** Maybe the most powerful Windows software router anywhere.



## CDRWin 4.0a beta

**W**hen it comes to making specialty discs or copying relatively strange formats, you want CDRWin. It's Golden Hawk's only product, so all the attention to detail and power features show.

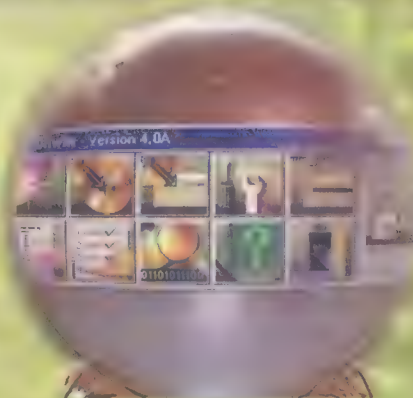
The program handles Data, Audio, Mixed-mode, and Multisession CDs, and lets you handle disc layout, track spacing, and even CD text. The app also has a fair chance of copying media from CD-based video games, depending on your optical drive. You can also enable and disable various error-correction algorithms (for troublesome CDs) and change the subcode analyzation routines.

CDRWin also handles typical CD-burning chores, such as selecting a group of MP3 files, decoding them on the fly, and creating an audio CD. For backup chores, you can drag and drop files or folders or type pathnames and filename wildcards. You can also create and burn ISO

image files. Of course, you can simply copy conventional CDs with one or two drives. This beta adds support for new drives and support for simultaneous multiple burning sessions with as many as 32 CD drives, which I didn't test for obvious reasons.

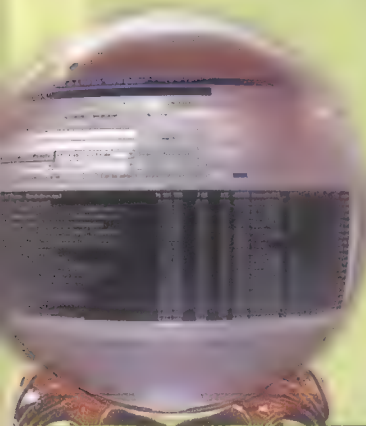
What's unchanged from previous versions is a simple, though extremely nonstandard, user interface consisting of 11 buttons, each with an image vaguely representing the tool it launches. Fortunately, button tool tips are reasonably clear. Dialog boxes are also stuffed with options, which is probably why you would want CDRWin in the first place.

The beta was stable, and every feature works as advertised. You are limited to 1X burning until you register the beta. ▲



**Official product name:** CDRWin  
**Version # previewed:** 4.0a beta  
**Publisher:** Golden Hawk Technology  
**Developer and URL:** www.goldenhawk.com  
**ETA:** Q3 2002  
**Why you should care:** Controls every aspect of burning a CD.

## WinMX 3.0 Beta



**I**n the post-Napster world of peer-to-peer file sharing, many programs can meet your MP3 fix. Among the more popular is WinMX. There are a lot of reasons to choose it over other apps, and one major reason not to, which the developers plan to correct. More on that later.

Essentially, WinMX simultaneously connects to a WinMX central server and networks using OpenNap/Napster protocols looking for MP3 files and about everything else, including ZIP, EXE, RAR, AVI, MPG, and MOV files. Thus, there's a good chance of locating files other peer-to-peer programs can't.

WinMX can conduct multiple searches at once and let you browse the results from one search

while another is finishing. You can limit searches to only users with high-speed connections or files of a certain quality. The software has no spyware or leechware embedded within it, either.

Historically, WinMX has been unable to download different segments of the same file from different users simultaneously. Adding this feature is the primary focus of 3.0, and thus far, it works. Unfortunately, it only works well if many people are using the beta, which isn't the case so far.

The beta isn't wildly popular because it isn't entirely stable. I repeatedly started downloads and searches that would hang. Future betas should solve this, but for now, multisourcing a file rarely happens. ▲

**Official product name:** WinMX  
**Version # previewed:** 3.0 Beta  
**Publisher:** Frontcode Technologies  
**Developer and URL:** www.winmx.com  
**ETA:** Q2 2002  
**Why you should care:** Maybe the best post-Napster file-sharing app out there.

## Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-around. Send your prospects to [bleedingedge@cpumag.com](mailto:bleedingedge@cpumag.com).

## Infinite Loop Suite Deals

Source: shop.microsoft.com

**I**f you've ever thought about purchasing Microsoft's Office XP applications piecemeal, think again. Check out how the pricing stacks up when comparing the Office XP Standard and Professional suites with the individual apps.

Applications	Purchased separately	Office XP Standard	Office XP Professional
Microsoft Access 2002	\$339		X
Microsoft Excel 2002	\$339	X	X
Microsoft Outlook 2002	\$109	X	X
Microsoft PowerPoint 2002	\$339	X	X
Microsoft Word 2002	\$339	X	X
<b>TOTAL</b>	<b>\$1,465</b>	<b>\$479</b>	<b>\$579</b>



## Affordable. Recordable. And Very, Very Portable.

Introducing the Memorex Pocket CD-R™. With 185 MB, it holds hours of MP3 music, 140 high-res photos or tons of data. At about three inches, it fits any pocket. At pennies a meg, it fits any wallet. With both writeable and rewriteable formats, it's big enough to do almost any job, yet small enough to go almost anywhere. For a closer look, go to [memorex.com](http://memorex.com). Because this little CD will be one of the biggest things in recordable media.



**Memorex®**  
Is it live or is it Memorex?™

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# OK People, Let's Hold Up A Minute

## Software Backup Apps Put To The Test

Perhaps the worst question any computer user can hear is, "Well, did you make a backup?" The question becomes even more aggravating when your answer is "No."

There was a time when backing up data took hours, often requiring a user to constantly change floppies or tapes to complete the task. When you finished the backup, you might have literally had a 2-foot stack of media staring you in the face to care for like a mother hen. And all it took was one bad floppy or tape to render the backup useless, which you usually didn't discover until attempting a restoration.

Fortunately, backup software has come a long way, as has the reliability and capacity of backup media. Today, you can back up 10GB of data in about 30 minutes and save your files to reliable CD-Rs, CD-RWs, Jaz and Zip disks, or tape drives. In addition, hard drives have become so inexpensive they are now an affordable backup option.

There are generally three main types of backup software for Windows users: cloners, change monitors, and what are known as classic backups. Each type of program has its advantages and drawbacks, depending on the intended user. As such, we can't declare one type of backup software is best for all users. Instead, we tested a group of various backup apps to determine how easy, quick, and reliable each app performed its intended functions. We also tested the programs' features for their flexibility in nonintended functions. To test the applications, we used a 1GHz Pentium III system running Windows 98 with a pair of Maxtor 7,200rpm UDMA/66 drives connected to a Promise UDMA/66 Fastrack drive controller.

### Dantz Retrospect Desktop Backup 5.6

Retrospect Desktop Backup is probably the most popular Mac backup

software on the market. Those familiar with the Mac version will be right at home using the Windows version, which looks and feels identical. The program's non-standard interface simplifies tasks, but it does take some getting used to. Ditto for the app's vocabulary, which is somewhat confusing if you're already versed in conventional backup terms.

Once you get past the program's GUI issues, Retrospect delivers nicely, although its compression and speed for a full backup aren't impressive, 4.29GB and 44:20 (minutes:seconds), respectively. However, the restoration speeds the program churns out can be very impressive. When doing a complete restore, Retrospect only replaces altered files by default (there is an option to do a complete file replacement if you want). Incremental backups are also fast and let you easily select specific files at specific times in the backup cycle. This is useful if you want the latest uninfected version of a file that you believe has become infected but you aren't sure when the infection occurred.

Despite warnings about backing up opened Windows files, backups and

restores worked flawlessly. Retrospect also makes short work of disaster recovery. Once you have made a backup, the disaster recovery tool makes a bootable recovery set out of your backup files, Windows CD, a blank floppy or two, and a set of blank CDs. The application restores the system drive and any data drives associated with the Snapshot that's used to make the restoration set. If the Snapshot contains several incremental backups, you can choose which versions of specific files you want to include.

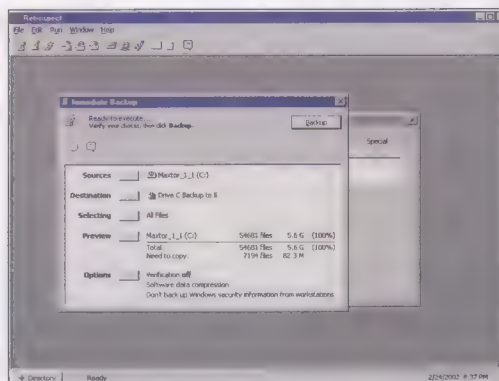
Retrospect Desktop's various automated options are also impressive. Friendly dialog boxes and wizards prompt you to create a backup rules set; setting the built-in scheduler for full or incremental backups is a breeze.

The Retrospect manual also bears mentioning. Not only does it explain how to use Retrospect, it describes different backup philosophies, covers the care and feeding of different media, and provides detailed lists. If the manual doesn't put your mind at ease about backing up your data, nothing will.

### NovaStor NovaBackup 6.6

NovaStor's family of backup programs includes such applications as NovaDisk, NovaDisk+, NovaBack SCSI/EIDE, and NovaBack QIC. The applications sell separately or as a package, with NovaDisk saving backups to hard drives or removable disks; NovaDisk+ writing data to CR-Rs and CD-RWs; NovaBack SCSI/EIDE writing data to SCSI and EIDE tape drives; and NovaBack QIC writing to QIC tape drives.

NovaBackup includes NovaBack and NovaDisk and is a classic backup application. Basically, you launch the program; choose the drives, folders, or files you want to back up; pick the destination device and filename (if applicable); and let the program go to work.



### Retrospect Desktop Backup 5.6

\$149.95

Dantz

[www.dantz.com](http://www.dantz.com)

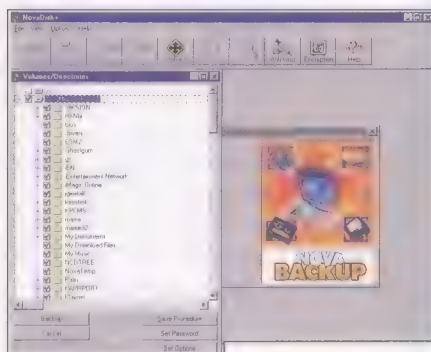




If you perform the same backup repeatedly, the My Backup feature memorizes your selections and options and performs the backup automatically. You can also store settings separately in Procedure files and schedule them with Nova's own scheduler. When saved to a hard drive, NovaDisk backed up our test drive in 21:30, breaking 3.94GB worth of data into 536MB files suitable for burning to CD. Performing a verification with the software took slightly longer.

NovaBackup also has some encryption and antivirus tools built in, but the tools are less than useful. The encryption method used isn't listed, so it's impossible to state how secure it really is. The antivirus module, which is supposed to catch infected files when they are backed up and restored, let Sircam-infected files through on our test system.

NovaBackup also had a bit of trouble opening some files, which makes using it to back up and restore data on a working Windows drive problematic. Because of this, Novastor bundles its Norton Ghost-like InstantRecovery tool. The tool is good, but it lacks some of Ghost's more advanced features. In addition, using InstantRecovery means that performing a complete disaster recovery requires using two tools, which can be a hassle.

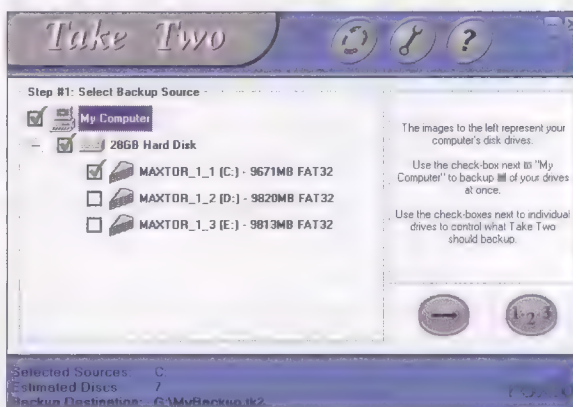


## NovaBackup 6.6

\$53.95

NovaStor

[www.novastor.com](http://www.novastor.com)



## roxio Easy CD Creator 5 Platinum (Take Two)

If roxio's GoBack Deluxe 3 is too unconventional for you, the company's Easy CD Creator is about as conventional as it gets, finding particular favor with those who use CD burners often. Overall, Easy CD Creator is flexible and has a multi-pronged approach to backups, but the program isn't perfect.

Easy CD's backup module, Take Two, easily copies groups of files, folders, or drives into a compressed file. Take Two can automatically burn the backup directly to a CD or create a file (or files) on a hard drive. In our tests, Take Two created a 3.64GB backup file in 20:40. You can browse backup files and recover individual files via a Windows Explorer plug-in that installs automatically. For emergencies, Take Two can build a boot floppy or CD.

Take Two lacks many advanced features, including incremental backup options or a built-in scheduler to automate the process. Backing up a running Windows installation (complete with open files and running programs) is problematic; sometimes it works and sometimes it doesn't. Optimizing a drive and shutting down as many programs as possible seems to increase the chances of not provoking an error message to appear. (In addition, some Windows 2000 users have reported problems of experiencing blue screens and extended boot times using Take Two. Roxio has made a patch available.) Data drives do back up without a hitch.

ECDC's other backup options include DirectCD, which lets you drag and drop files directly to a CD or use your own

## Easy CD Creator 5 (Take Two)

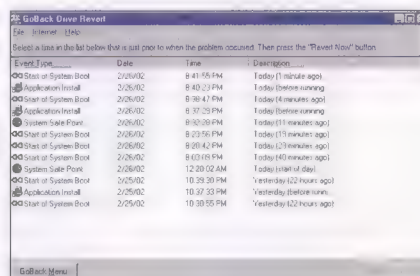
\$99.95

roxio

[www.roxio.com](http://www.roxio.com)



batch files via the good old copy and xcopy DOS commands. When launched with Windows' own built-in scheduler, this provides a rather targeted automated backup system for data files or programs that aren't constantly running. Files backed up in this way aren't compressed (though an expert could add a few PKZIP commands to a batch file), but you can look at the backed-up file from almost any PC via a CD drive in an emergency.



## GoBack Deluxe 3.11

\$49.95

roxio

[www.roxio.com](http://www.roxio.com)



## roxio GoBack Deluxe 3.11

If Norton Ghost is a fully manual backup program, GoBack is the fully automatic application. The program constantly monitors your computer, making copies of any and all file changes, additions, or deletions. It also adds a boot manager that can restore a system to a last known working state, even if Windows is corrupted. Although this sounds like a dream come true for many of those users who constantly try new hardware and software, or just fear viruses, there are a few drawbacks.

First, GoBack doesn't back up data to removable media. Also, it doesn't copy files on a drive before you installed the program;



it merely copies files that have been changed or deleted. As a result, GoBack only works when your computer and hard drive are functional. Offsite backup storage and disaster recovery just isn't possible with the program. Also, the software only works with Windows, and booting from an ordinary boot disk takes extra steps. In addition, the constant monitoring the program does slowed down our system by about 3%.

Otherwise, GoBack works as advertised. Despite repeated attempts to fool it by adding and removing hardware and software, GoBack faithfully logged changes, making copies of files to a 4GB region specified at installation. GoBack can also show a historical list of activity, including application installations. You can click a Safe Point and click the GoBack button to restore your system to that point. If Windows won't boot, you can press the Spacebar at the GoBack boot screen and choose a Safe Point from there.

These features are where the standard edition of GoBack ends. A Deluxe version of the program offers the ability to restore files that may no longer exist after a roll-back. For example, if you worked on a Word file and then roll back to a point when the file didn't exist, GoBack Deluxe presents a list of files created since that time, including the Word file, so you get back them up.

### Stomp BackUp MyPC 4.6

BackUp MyPC is based on Veritas' Backup Exec, a well-regarded backup product that bundles with many tape drives. But don't be fooled by its history with tape drives; BackUp MyPC works well with CD-Rs and CD-RWs, second hard drives, and partitions. The program also has a few features that the competition lacks.

The program works in the classic backup style, letting you select drives, folders, and files to back up, and the destination you

want to write them to. The application offers a wide range of compression and auto-verification options, but the program's default setting backed up our test drive in a quick 20:20, writing a 3.75GB file.

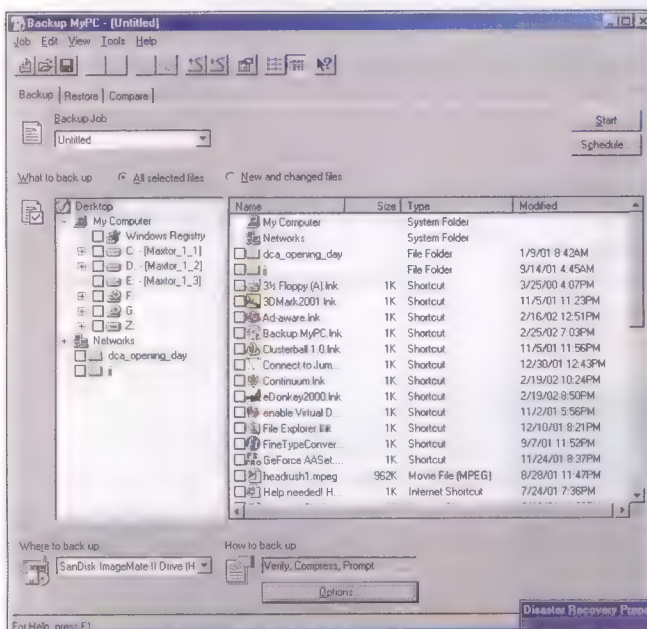
In addition to complete backups, BackUp

Despite repeated attempts to fool it by adding and removing hardware and software, GoBack faithfully logged changes, making copies of files to a 4GB region specified at installation.

MyPC offers both incremental and differential backups. An incremental backup stores all changes from the last incremental backup, and it typically works quickly. However, a restoration requires all the incremental backups, plus the original. A differential backup stores changed files since the last full backup. This approach takes longer than an incremental backup, but you only need the last differential backup file, plus the original.

Once you have your backups, the program can restore your drive with its Disaster Recovery Set, which makes either bootable CDs or floppies to go with your backup set of CDs. If your emergency is less dire, BackUp MyPC can restore a working Windows system while Windows is running by restoring the nonopened files first, then rebooting, and then finishing the job. This works fast and flawlessly and cuts down on the boot disk clutter.

The program has perhaps the clearest wizard of any products I reviewed, both for backups and restores. The wizard appears automatically when the application starts and then offers easy source selection, destination formatting, and automatic backups via a built-in scheduler.

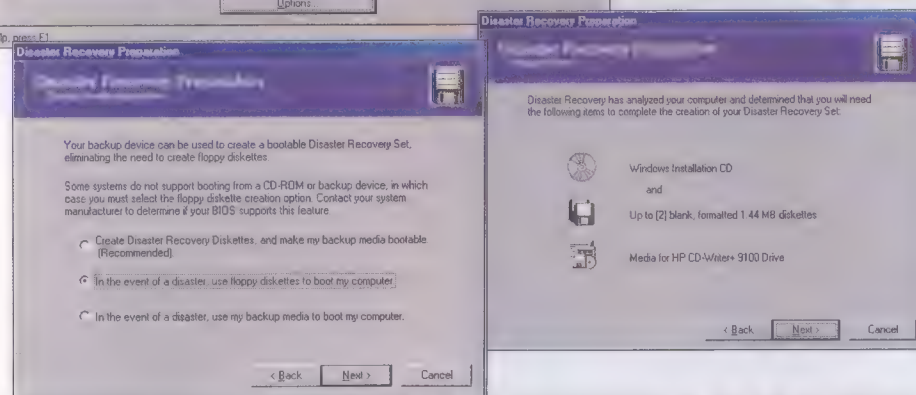


### BackUp MyPC 4.6

\$79

Stomp

www.stompinc.com



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



Canceling the wizard reveals a nice, intuitive interface, too.

As a longtime Ghost user (I run Ghost 2001 almost weekly), I was pleased to find many useful features have been added to Ghost 2002, although I was left wondering why a few made the cut, but more on that later.

Ghost is a classic drive cloner, which is probably the most straightforward way to make a backup of a Windows boot disk. However, how the program does so may surprise you. The big trick to making a complete Windows backup is copying files that Windows leaves open when it's running. Instead, Norton Ghost makes a boot floppy, and you reboot and back up with this, using what is essentially a good old-fashioned DOS program. Restores are made the same way, with that same boot floppy.

Most Norton Ghost users copy one hard drive (or partition) to another hard drive (or partition) for backups, to either

take a system snapshot before making upgrades or changes or to make duplicate setups for identical systems. In this capacity, Norton Ghost is extremely fast, backing up our 6.5GB Windows test partition in 20:10 at the program's Fast speed (and low compression), making a 3.68GB backup file. It completed the same task in 28.09 at the highest compression, making a 3.25GB file, to another hard drive.

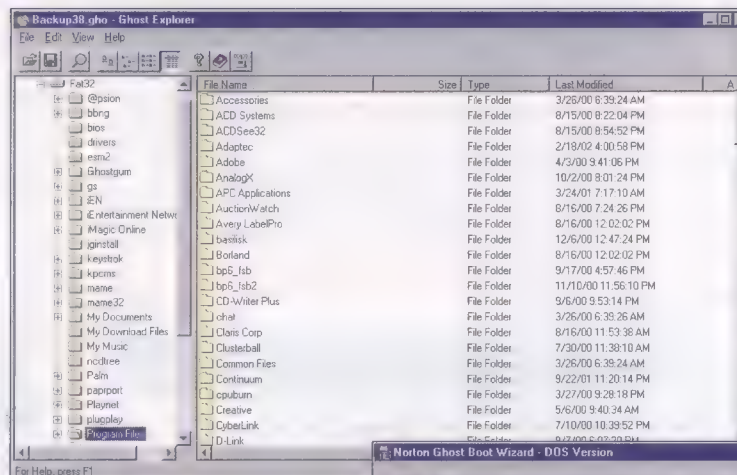
For disaster recovery tasks, Norton Ghost can write to CDs and many SCSI tape drives, which takes longer but also means you can take the media with you. Norton Ghost also supports the linking of two computers together via parallel, USB, or network cables. For restoring individual files from a backup, there's Ghost Explorer, which opens a backup file from various sources and lets you browse a file's contents.

Norton Ghost 2002 supports Linux and NTFS partitions, and its boot-disk maker offers more options than ever, which is good. Unfortunately, every restore requires typing the Ghost serial number, which gets

annoying quickly. **CPU**

by Warren Ernst

Ghost is a classic drive cloner, which is probably the most straightforward way to make a backup of a Windows boot disk. However, how the program does so may surprise you.

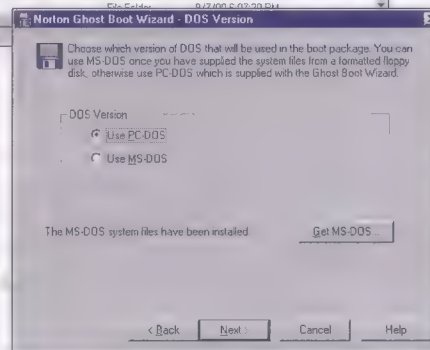


## Norton Ghost 2002

\$69.95

Symantec

www.symantec.com



## Backup Recommendations

Nearly any one of the products reviewed here is suitable for creating a safety net of some sort for your computer. Consistently running one of these applications could certainly save your data (not to mention your skin) when trouble does arise. What is really important is actually using a backup program, whichever application

you choose.

If you don't need incremental or unattended backups, then Norton Ghost 2002 is everything a backup program should be. It's simple, fast, and reliable. It is also excellent both at taking snapshots of past working configurations and at disaster recovery. If you need unattended and incremental backups,

BackUp MyPC gets the nod. Finally, if the idea of spending a lot of time making backups doesn't exactly appeal to you, or you just aren't overly concerned with disaster recovery, Roxio's GoBack is the most seamless, nearly magical way to return your PC to a working state, and it is worth checking out. ▲

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



by Steve Smith

## Raytown Stealth Email Redirector 3.0

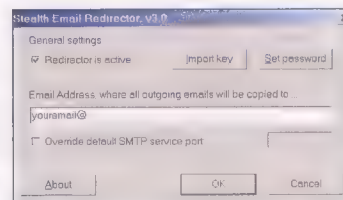
What do an employer, a suspicious lover, and a snoop have in common? They may all want to monitor the e-mail you send from your computer. Stealth Email Redirector may be the program to help them. SER monitors the SMTP port, which is where almost all standard e-mail programs send outgoing mail, and sends a duplicate copy to other e-mail address you designate.

Installing the program, which works with Windows 95/98/Me, involves one small window of options. Select a single checkbox to tell the program to turn itself on or off and type in the e-mail address where you want SER to send copies. The process requires a single reboot of the PC, and from then on, SER sends copies of all outgoing e-mails to the addresses you've designated. There are options for setting password access, and in the case that the computer's SMTP port is not set to the standard 25, you can tell SER to monitor an alternative port.

In our tests with Microsoft Outlook, SER worked as advertised. Copies of e-mails we sent on our test system showed up immediately in the target account we had assigned. But there are a few caveats:

Tell the program to send the e-mail copies to an inoperable e-mail address, and the host PC ends up getting "mail undeliverable" messages, which would give up the game to anyone under surveillance. Also, the program does not monitor e-mails from clients that circumvent the SMTP protocol, namely AOL and Web-based e-mail clients, such as Hotmail. So anyone who knows how a program such as SER works can get around it easily by sending e-mail through these other channels.

Finally, this is one downloadable shareware program that you need to register in order to use successfully. Unregistered versions cause a window to pop up on the PC at boot up, alerting the user that this monitoring software has been installed. Notifying a subject he is being watched is not typical CIA procedure, so serious spies will need to give SER a dry run on their own and then pony up the \$89.95 to get any use from it. Speaking of which, considering the simplicity of the program and the ease with which a paranoid, tech-aware employee could get around it, the price does seem rather steep for a simple spy tool that is otherwise serviceable. ⚠



From Stealth Email Redirector's single setup window, you instruct the program where to send copies of any e-mail that is sent from the host PC.

### Stealth Email Redirector 3.0

\$89.95 for licensed version

Raytown

ser30@softsecurity.com



## FailSafe Technologies Guard-IE 2.3

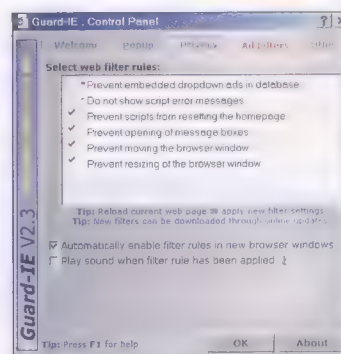
Fed up with the intrusiveness of some Web sites? Tired of irritating pop-up ads and clusters of unwanted new browser windows littering your screen? Sick of cookies tracking your every click-through? Guard-IE is a handy little plug-in that works with IE 5.01 and higher to solve these problems on two levels: It guards against Web sites taking over your Desktop with unwanted pop-up ads and new browser windows, and it suppresses embedded drop-down ads, a new way that several major portals are trying to grab another slice of our mind share. On another level, it protects your privacy by managing the cookies and "bugs" that Web sites and ad networks plant on your computer in order to track your online behavior.

Guard-IE's feature set is impressive enough, but the program's implementation is truly stellar. Seven small icons on the browser toolbar give you astonishing control over how Web sites are allowed to intrude on your Desktop. For instance, you can tell Guard-IE to disable all pop-up windows of any kind or let these windows

open for two seconds before closing. Better still, you can recall and launch previous pop-up ads from a drop-down menu of thumbnail images. Very cool. Users can specify URLs or domains that should be allowed to spawn pop-ups. This is important, because by default, Guard-IE will block any new window a site launches, including some video consoles and pop-up slide shows.

The program catalogs the cookies that have been planted on your system and lets you delete any or all of them. Even your browsing history can be erased on the fly so that URLs you visited recently won't show up on IE's drop-down address bar. Guard-IE can also prevent Web sites from taking over the computer screen or resizing and relocating browser windows.

Guard-IE seems to understand that true control freaks are not content with micromanaging their own browser experience; they also want to control every detail of the programs that let them control their browser. Guard-IE lets us indulge the obsession. ⚠



The tabbed menu for Guard-IE lets users micromanage the ways in which Web sites and advertisers display ads and other intrusions.

### Guard-IE 2.3

\$24.95

FailSafe Technologies

www.failsafetechologies.com





## Tiny Software Tiny Trojan Trap 3.0

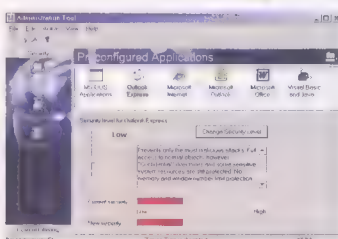
Even the best antivirus software is only as good as the program's own database of known viruses. These utilities are updated frequently to respond to new strains of system-destroying bugs, but a user has to be diligent about getting the latest version in order to stay safe from the newest strains that worm their way through the Web. Tiny Trojan Trap 3.0 is designed to be an even deeper defense against virtually any kinds of system intrusion.

If antivirus software is the armed guard at the outer gates of your PC castle, this program is more like the Secret Service. It literally wraps itself around your PC's resources in order to monitor them and block all attempts by any program (ActiveX, Java, executables, etc.) to alter settings or plant cookies and codes on your system. Tiny Trojan Trap (oh, let's call it TTT, OK?) installs easily and runs from the Taskbar at startup. Its standout feature is the incredible control it provides over the levels of security to assign different parts of the system. Clearly designed with IT administrators in mind, the Administration Tool lets you declare how specific programs can or cannot address resources such as the Registry or files. Drill deeper still, and the program lets you micromanage whether programs can do such things as add or delete objects from a file and change attributes.

In short, there is more customization power under the hood than most users will need, although

Tiny Software has done an admirable job with the online documentation, a well-indexed Help file. It explains all of the program options in clear layman's language and in a navigable Help file that other software makers should emulate. Better still, TTT, which runs on Windows 98/NT/2000/Me/2000, works very well without any expert tweaking. With the default settings active, the program warned us when Web sites were trying to run programs from our system or drop cookies. The Agent screen keeps a running record of all processes, both internal and external, that address resources and whether TTT has blocked or permitted them.

Although this shareware program is powerful and effective, you should probably try it on your own hardware configuration before you buy. In one installation, TTT seemed to cause inexplicable system lags and freezes when active, although in most cases, it worked fine. The company, which does not provide phone or e-mail support for its program, warns that Tiny Trojan does not work with multiple processor systems, and it may conflict with Norton Anti-Virus installations. And although version 3.0 of the program has integrated McAfee VirusScan software, the scans don't provide any detailed feedback. All caveats aside, however, if it works smoothly on your system, this can be an eminently powerful firewall for true security freaks. ▲



### Tiny Trojan Trap 3.0

Shareware; \$39.95

Tiny Software

[www.tinysoftware.com](http://www.tinysoftware.com)



### File Protector 2001

\$30

Mikko Technology

[www.mikkotech.com](http://www.mikkotech.com)



## Mikko Technology File Protector 2001

As with securing a house, PC system protection can take many forms and require various degrees of sophisticated software. But rather than erect high walls or elaborate alarm systems to detect intruders, sometimes the best way to keep your valuables secure and unsullied is just to lock them away. File Protector 2001 is a handy utility that lets you manage exactly how prying eyes and intrusive programs access your data files, drivers, and executables. It can make any file simply invisible to other users, or it can prevent others from renaming, deleting, executing, or writing to a file.

File Protector 2001 works from a single pop-up screen that is password-protected, of course. From it, you can browse and mark files or directories to which you apply a number of possible

attributes. You can also use wild cards to affect the same file names or types across multiple directories. The program, which works with Windows 95/98/Me/NT/2000/XP, does work as advertised, effectively changing the access parameters on any files in the system.

Like too many shareware programs, File Protector 2001's interface is amateurish, requiring several clicks to complete an attribute change. The buttons are poorly labeled so that their functions are not always clear. Within the context of this program, what exactly does "Activate" mean, for instance? A contextual help file would help this program immeasurably. The functionality is nice to have, but \$30 seems a bit steep for an unpolished effort. ▲



## One Blog To Blog Them All

**T**his month's buzzword: blogging. What exactly is blogging? Nobody really knows for sure. According to John C. Dvorak, "Cat pictures dominate too many of them." Evan Williams' free.blogger.com service brought blogging to the Web mainstream. Blogging lets those without prior HTML knowledge create and maintain Web sites filled with links, images, and personal dialog. Evan recently released a Blogger API, letting people use tools like Bloggar (bloggar.cjb.net), a 32-bit front-end. For those who crave more control, there's other software available.

When I first visited LiveJournal.com, I didn't realize it was a blogging resource for the layman. I thought: Gee, people publishing their innermost thoughts online—unique, but nothing to write home about. Literally. Months later, I was looking for an easy way to manage news content on Lockergnome.com. Blogger.com came to the rescue. It offers support for multiple users and Web logs, generates archives, and applies timestamps automatically to every post. When it came to enabling comments for published items, I decided to shop around.

First up is Radio UserLand (30-day unlimited trial, \$39 to keep; radio.userland.com) for both Mac OS X and Windows users. It not only helps maintain a blog, it's a way to stay connected with your favorite Web sites and online news services. You'll be up and running in less than 5 minutes. It's quite possibly the easiest and most powerful personal content management tool I've used. I use it every day, if only for its RSS (Really Simple Syndication) parsing feature. Sites like Slashdot and Betanews have created RSS feeds you can use to view their latest uploaded headlines. In one click, you can publish a story with its direct link and your perspective appended to it.

If you don't want to work with the WYSIWYG HTML editor, you can edit your source directly. While their predefined designs are relatively limited, you can quickly create your own. Push-button site generation is something even we old-school coders can appreciate. You get free Web space with Radio, too. Of course, you can also integrate it seamlessly with an existing site (or set of sites because one Radio

install can manage several content channels). Oh, I haven't even mentioned the best part: Radio runs completely within the browser.

"So, blogging is just like having a home page?" Yes, only it's infinitely easier to manage (on both the front end and backend). If Radio doesn't trip your trigger, consider something like Movable Type (\$20 donation; movabletype.org). It's for those who don't require as much handholding. You'll need to set up a Web server on one of your boxes, local or remote, as MT is nothing more than a set of Perl scripts.

MT takes some tweaking; it won't give you the best OOTB experience. The default page template(s) seem buggy in IE 6.0, but once you've mastered the data variables, you'll be set. When you post an entry in MT, visitors can easily add their own comments (which further drives the blogging phenomenon). Documentation is clear and concise, so as long as you RTFM you won't get lost. The program is completely Web-based.

Is that all? Hardly. Greymatter (noahgrey.com) is a popular CGI program, but it is also no longer in development. In fact, Michelle Catalano (whose blog is at asmallvictory.net) says this about the software, "It's simple to use and makes blogging easy, but if you are a prolific blogger, Greymatter will bog down on you at some point. Most people find that after 300 or so posts, GM tends to seize up." Still, for some, it works well enough.

Still don't get this "blogging" thing? Sites like Daypop.com and Blogdex (blogdex.media.mit.edu) tell you which links are getting "blogged" most frequently during a particular hour. And here are some thoughts that might go through a blogger's (one who blogs) mind: Life is uncensored; if you don't like what you see, look elsewhere. I love talking about my life. I love writing about other people's lives. I'll post whenever I feel like posting. You don't have to agree with everything I say. Blogging is therapeutic. ■

*Chris blogs at [chris.pirillo.com](http://chris.pirillo.com). You can dialogue with Chris at [chris@cpumag.com](mailto:chris@cpumag.com).*

**I'll post whenever I feel like posting. You don't have to agree with everything I say.**

*Chris Pirillo is a geek in every sense of the word. When he's not distributing technology tidbits on Lockergnome.com, he's hosting "Call for Help" on TechTV ([callforhelp.tv](http://callforhelp.tv)). Every Sunday, he hosts a radio call-in program, assisting people with their technology troubles. This guy is also a motivational speaker; he drinks coffee to slow down. He also enjoys making fun of people who read magazine columnist bylines.*



by Pete Loshin

## Skin, Seeds & Stems In No Particular Order



*Pete Loshin, former technical editor of software reviews for BYTE Magazine (print version), consults and writes about computing and the Internet. He also runs [www.linuxcookbook.com](http://www.linuxcookbook.com). He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.*

**N**ew open source Web sites and projects pop up faster than dings on a new car in Boston, so this month I'm taking the easy way out with eight quickies—in no particular order.

1. Evolution from Ximian ([www.ximian.com](http://www.ximian.com)) solves the "but what about Outlook" problem for would-be Linuxians. Starting with a dandy free mail client, plus calendar, plus contact/task manager that even syncs with your PDA, Ximian adds the Connector (\$69; 25-pack for \$1,499) for workgroup interoperability with Outlook 2000 right now and Exchange Server 5.5 sometime soon.

2. BSD is back with new revs of OpenBSD ([www.openbsd.com](http://www.openbsd.com)), FreeBSD ([www.freebsd.org](http://www.freebsd.org)), and a commercial Desktop version of NetBSD from Wasabi Systems ([www.wasabisystems.com](http://www.wasabisystems.com)) since late last year. With Apple touting OS X ([www.apple.com/macosx](http://www.apple.com/macosx)) as an adaptation of FreeBSD, the company claims BSD outnumbers Linux on the Desktop, three to one.

3. Before you design a spaceship, visit the Open Channel Foundation ([www.openchannel.foundation.org](http://www.openchannel.foundation.org)) for open source tools for scientists—rocket or otherwise—from NASA, JPL, and over two dozen other institutions. Check out the PIKT (Problem Informant/Killer Tool) security-monitoring tool from the University of Chicago, build the mobile MITRE minirouter "for use in tactical environments," or try XMX, Brown University's X windows screen-sharing groupware solution. The variety runs from psychometrics to statistical analysis.

4. Linux runs everywhere, from IBM mainframes to Sony PlayStations. Even Pocket PCs, designed for Windows CE, and proprietary Palm OS-based PDAs, are falling as the penguin keeps hacking. Psion palmtop users can now try the PsiLinux experience ([linux-7110.sourceforge.net](http://linux-7110.sourceforge.net)), and for an out-of-box Linux experience, Sharp's Zaurus SL-5000 should be shipping by now with a heart of Linux and Java.

5. Leading Linux distros keep getting fatter. Even with plenty of drive space, you may not want to administer software you never use. Paring the installation is no fun either, particularly if you have mucho machines to set up. Why *<i>not</i>* roll your own

distribution? Linux From Scratch ([www.linuxfromscratch.org](http://www.linuxfromscratch.org)) lays out the process fairly easily—and it's a great way to see what makes Linux tick.

6. Remember when I tried installing Linux on a 4MB notebook (see January's *CPU* issue)? The RULE (Run Up2date Linux Everywhere) project plans to adapt the Red Hat distribution to trim the installer so it runs in under 32MB of RAM and gives users the option to install Linux on resource-impaired systems. If only it would have started a year ago, I'd be writing this on my Concerto. Check progress at [www.freesoftware.fsf.org/rule](http://www.freesoftware.fsf.org/rule).

7. Being married to Windows doesn't mean you have to pay for apps. There are hundreds of reliable, community-supported Windows programs. Apache, OpenOffice (foundation for Sun's StarOffice), Perl, Emacs, VIM, and others run on Windows, while Cygwin ([cygwin.com](http://cygwin.com)) ports a Unix-like environment to Windows. I wonder what happens if you try running the Windows emulator WINE on top of Cygwin on top of WinXP? Scary. A quick Web search should turn up open source options for almost any app. The good

apps tend to get ported first, but if you can't find what you want, adapt something that's close or hire someone to do it for you. After all, it is open source!

8. Got kids? Worried about inappropriate computer games? Well, at least you won't pay as much for the games (see "Warm Up To Penguins" in *CPU*'s February and March issues). But if you want your kids to learn about TCP/IP and fsck'ing before the third grade, throw Windows out the window. Kid- and parent-friendly Linux Web sites keep popping up, along with educational games and other activities. Three good portals: Linux For Kids ([www.linuxforkids.org](http://www.linuxforkids.org)), Open Source Schools ([open.sourceschools.org](http://open.sourceschools.org)), and the Simple End User Linux/edu page ([www.seul.org/edu](http://www.seul.org/edu)); Blue Linux ([www.bluelinux.org](http://www.bluelinux.org)) is a distro for educational users.

I'll try to get back to these topics in coming months; let me know which ones you want covered first—or covered never! ■

*Get saucy with Pete at [opensauce@cpumag.com](mailto:opensauce@cpumag.com).*

**... proprietary Palm OS-based PDAs, are falling as the penguin keeps hacking.**



# DVD changed the way you see movies.



# Now it changes the way you make them.

Hitachi introduces the world's first and only multi-format DVD camcorder.

The incomparable Hitachi DVD camcorder brings the sophistication and simplicity of DVD to home movies. It records in two formats, DVD-R or DVD-RAM, and plays back on most computer DVD drives and most standard DVD players. It shoots still photos, too. You can edit on your computer and make copies of discs for friends with optional editing software. Or edit on the camcorder itself; DVD's simple navigation makes it easy to access recorded material. The Hitachi DVD camcorder. Home movie making will never be the same again.

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pioneering camcorder technology

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## Words From The Web

Yeah, they *actually* said this . . .

From a Parentsplace.com  
message board on, um,  
soap making:

"I had NO idea you could  
make soap! Geez,  
where have I been?"

*Soap doesn't come from the  
Soap Fairy, lady.*

From a Yahoo!  
professors chat room:

"Did I not explain to you  
that you have no brains?"

*Could you draw us  
a picture?*

From a Yahoo!  
gardening chat room:

"I think if I went to church, that  
upon stepping into the building  
there would be a flash of light and  
nothing but ashes of me left."

*What exactly are  
you growing?*

From a Yahoo!  
small-business chat room:  
"I've been without power  
10 days, and up to my a\*\*  
with paperwork."

*Just like CPU  
headquarters . . .*

From an MSN computer's chat room:  
"A survey shows that 98% of people  
that work on PCs gain 5 pounds  
of fat a week."

*A survey of my waistline  
bears this out.*

## Tales Of Pterodactyls

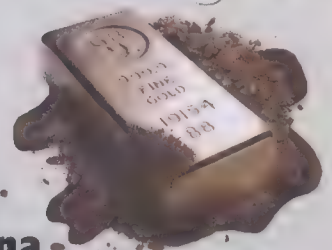
I like a good story as much as the next person, and I've found some terrific short stories at Timothy McSweeney's Unreserved Embrace ([www.mcsweeneys.net](http://www.mcsweeneys.net)). This site is packed with humorous and often witty stories, including a tale about buying insurance coverage for Pterodactyl attacks and a "diary" of a new recruit who just joined COBRA, the arch-nemesis of the G.I. Joe gang. My favorite is a treatise called "On The Implausibility Of The Death Star's Trash Compactor," an in-depth discussion of the failings of the Evil Empire's waste removal system.

You can submit your own clever tale to McSweeney's if you check out the site's submission guidelines, which are as funny as the stories. The submission guidelines are buried in

a thicket of links on McSweeney's front page, so you may want to bypass the link forest and go straight to the archives, where dozens of short stories are listed by their date of publication. ▲



## Infinite Loop




**Psst.  
Wanna  
Buy Some . . . Mud?**

A heavy African mud known as Coltan goes for as much as \$80 a kilogram. Why such a high price for mud? Coltan, which is just a little lighter than gold, can be refined into tantalum, a material that's an excellent conductor of electricity but also extremely heat resistant.

SOURCE: NEW YORK TIMES





# MULLET MADNESS

**A**h, the big '80s. Many people of my generation have a passionate nostalgia for those halcyon days of electronic pop music, radiantly colored clothing, and the mullet. Yes, the mullet, the epitome of fashion sense (or fashion senselessness) for those glory days gone by. In 2001, there were rumors (very brief rumors) that the mullet was making a comeback. CPU writer Cal Clinchard often shakes his mullet with pride while air-strumming "Paradise City" as he's driving his '81 Camaro, so maybe the comeback rumors are true. I'd like to say that I've never had a mullet in my life. Nosiree! Not ever! I'd like to say that, but . . .

There are numerous mullet-related sites on the Web, but the best one I've seen is Mullet Madness at [www.mullet](http://www.mullet)

[madness.com](http://madness.com). The site has tongue-in-cheek mullet-related features and news reports. Don't miss the Mullet Of The Week and the Ask Mr. Mullet column. Stop by the Goodies section of the Web site to send your buddies mullet postcards. You can also sign the guest book and read messages posted by Mullet Madness fans. You'll also find deep, moving mullet haikus such as this one:

O! SQUIRREL brother,/ Your tail, my hair. We are one./ Yet I must eat you.

No mullet site would be complete without pictures of people sporting the god-like locks. The If They Were Mullets section slaps a "Tennessee Tophat" on several well-known public figures, including Bill Gates, Elijah Wood (of Lord Of The Rings fame), and Ben Affleck. If you're strongly pro-mullet, you can express your loyalty to the 'do with a "Got Mullet?" T-shirt (extra large available). Or you can attempt to win a T-shirt by entering the monthly mullet contest. Rock on, baby, rock on! ▲

## Animal Wafers

**W**e all know that bugs, viruses, and worms can creep into computers large and small, but some computers may also be infested with buffaloes, dogs, and even Daffy Duck or the Road Runner. Apparently silicon chip designers have a sense of humor (who knew?) and oftentimes include microscopic doodles on silicon chips. Most of the doodles are less than a millimeter in size, and some are only about 20 microns. You can find a collection of these miniature works of art at the Silicon Zoo ([micro.magnet.fsu.edu/creatures/index.html](http://micro.magnet.fsu.edu/creatures/index.html)), a site maintained by Florida State University.

The "zookeepers" use high-powered microscopes to take pictures of the miniature drawings they discover on the chips and then post the pictures to the Web. Most of the doodles are rather simple, but some (such as the portrait of the Norse god Thor) are surprisingly rich in detail. The site also contains information about how the drawings are made and photographed.



## The Art Of Googlewhacking

**S**pring is here, and with its arrival, our thoughts turn from snow drifts, icy winds, and corporate collapses to sun, fun, and the time-honored tradition of Googlewhacking.

Googlewhacking is the painstaking process of finding a single result in a Google search using two search terms (called googlefactors). If you can ring up only one hit with your combination of terms, you win and become an official Googlewhacker. You can also add to the already curious phraseology of the Internet. Previous Googlewhacks include "quintuplet gorgonzola" and "panfish interrogation," which sound interesting to me.

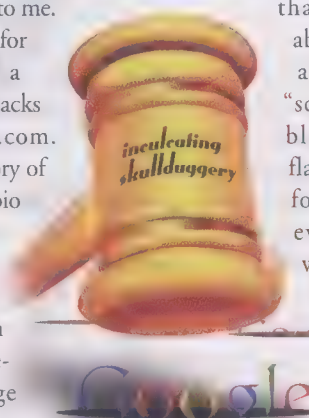
You'll find the rules for Googlewhacking and a list of recent Googlewhacks at [www.googlewhack.com](http://www.googlewhack.com). There's also a short history of Googlewhacking and a bio of Gary Stock, who originated the term.

Finding a Googlewhack is harder than you'd think, partly because of Google's huge

database of billions of Web pages and partly because as soon as a Googlewhack is found, it's not likely to remain one for long. Google's database is constantly updated, and if you post your newly discovered Googlewhack, chances are Google will find it and add it to its database.

I'm all for wasting time, especially when it involves using the Internet, and most especially while I'm getting paid for it, so I did a considerable amount of Googlewhack hunting. I came close with "carbonating wig," and I thought "ferromagnetic meat"

would be a lock for sure, but that search turned up about 187 results. Finally, I found a few: "schistosomiasis rollerblades" and "quixotic flayer." I decided to go for a Triplewhack and eventually came up with "Euclidean jelly heaves." Now that's a hard day's work. ▲

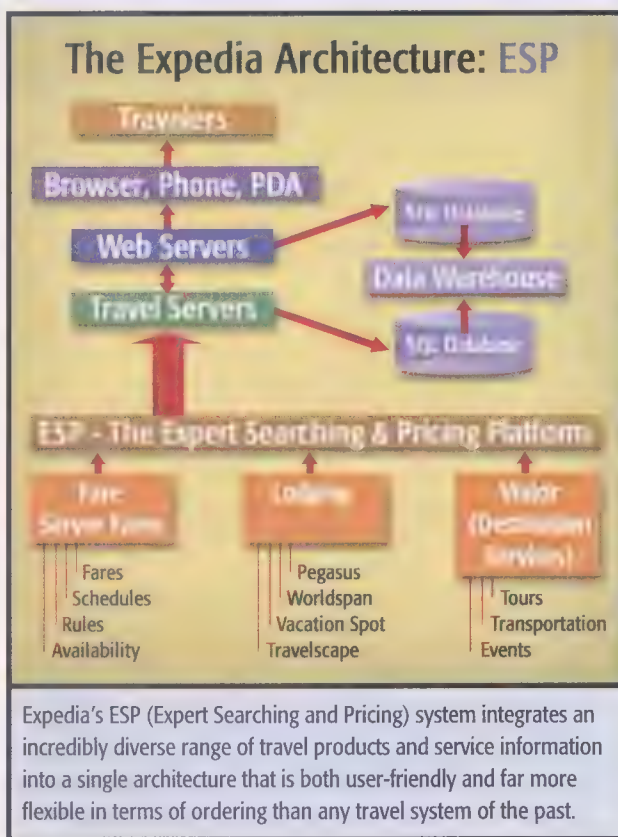


If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of Fringe, send your suggestion to [fringe@cpumag.com](mailto:fringe@cpumag.com).

TIME WASTERS



## The Expedia Architecture: ESP



If you've used the Web to book travel necessities such as airfare and lodging, odds are you've been to Expedia. And Travelocity. And Orbitz. The list of online ticketing vendors goes on and on, not to mention direct fare sales from the airline, hotel, and car rental companies themselves. You could literally spend hours researching a simple round-trip ticket to Hackensack.

Even worse, as you wander through these outlet sites, you'll feel like you've stepped into an unimaginative cloning experiment. The tabbed UIs and calendar-based departure/return wizards have all the originality of a Days Inn. This uniformity exists because the layout works: It's practically idiot-proof, which is partially why, according to Forrester Research, over \$17 billion in travel is now booked online. But if you think that because all of these sites look the same that they offer similar services and pricing, think again.

Expedia is often not the cheapest ticket in town. (Orbitz's exclusive Web fares typically buzz past the competition, thanks to

the fact that the company is owned by several major airlines.) But MS Office isn't the cheapest productivity suite, and Windows Media was once a joke among Real Audio listeners. Expedia is today's leading travel site because, like most other Microsoft projects, it combines fair value with a wide range of easy-to-access tools. Sure, you can get all of Expedia's services elsewhere, and sometimes for a lower price, but no one else has

# Inside Expedia

## Microsoft's Fledgling Takes Off

Expedia's feature breadth and convenience. For increasing millions of travelers, that convenience is worth a few extra bucks.

### From DOS To Destinations

During the mid-1990s, Rich Barton, Expedia's CEO, was on the MS-DOS team at Microsoft, and even then, Microsoft had its present philosophy of only pursuing a product if the net revenue line could show enough zeros. Barton moved over into consumer products where he worked on "coffee table" CD-ROMs like Dogs and Dinosaurs, and in the early '90s he was charged with researching a travel/destination disc project. The bad news was that Barton decided there wasn't enough money in a travel CD to be worthwhile. The good news was that he discovered the world of travel and recognized a massive opportunity.

At that time, the travel-booking industry was based on a set of inflexible mainframe systems dating back to the early

1960s. Barton saw that modern servers running modern database systems could not only handle the same tasks more efficiently but also provide for a far more integrated booking technology incorporating practically any aspect of travel, not just airfare. Barton pitched the idea to Bill Gates, Bill loved it, and Expedia took root.

ESP. Expedia launched in 1996, and over the next five years, Expedia devoted more than 1 million man hours to creating its ESP (Expert Searching and Pricing) system, which went live in January 2001. Older air travel systems merely plucked somewhere between six and 15 of the most likely search hits from a list of more than a half-trillion potential results. ESP takes airline, lowest price, shortest flights, and

It's not quite like being there, but Expedia's many 360-degree destination photos and accompanying essays help to give you a better taste of what you can expect from these dramatic locales.

departure and arrival times into account, then offers 150 to 1,300 results. These might be arrayed as a series of 30 outbound and 30 inbound choices, providing 900 combinations across two screens.



In 1999, Expedia realized \$819 million in sales (including Travelscape and Vacation Spot revenue, both acquired in March of 2000). That same year, Expedia broke away from Microsoft, primarily because travel isn't a core pursuit for a software company. Microsoft, however, retained 70% of Expedia's stock up until January 2002, at which point Microsoft traded its 70% of Expedia for roughly 11% of USA Networks. So USA Networks owns a majority share of Expedia, and Microsoft owns a minority share of USA: another intriguing move in Microsoft's chess match for the American living room.

### Features & Flexibility

We could fill this magazine detailing all of Expedia's ins and outs, but a few key points bear attention. Notwithstanding ESP's extra sorting capabilities, the air, hotel, and car reservation functions are all fairly standard issue. Expedia works with 45,000 lodging properties, including 2,000 vacation rentals, and offers 24-hour price protection on over 4,000 locations. One cool feature is Expedia's integration with Microsoft's MapPoint, allowing MapQuest-like street views with lodgings shown on the map. If you know the location of a conference center, for example, but still need a room, this feature is indispensable.

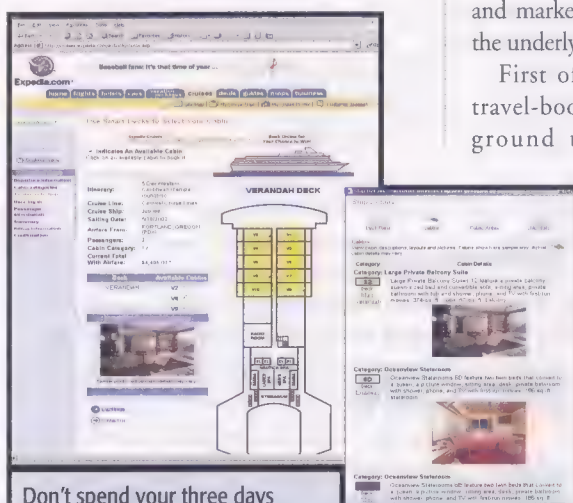
You can spend hours poring over the Cruises area, sorting by date, destination, price, cruise line, and even individual ship. With over 115 ships to choose from, you'll find options such as the number of people you want at your dining table and floor plans for each deck of the boat so you can see and select any available room. We noticed that some amazing deals could be had if you watch the departure times carefully. A seven-day Windstar Bahamas cruise ran \$4,410 one week, \$1,345 the next, and \$2,285 the following week.

The vacation package wizard appears fairly straightforward. Take your pick: flight and hotel; hotel and car; or flight, hotel, and car. But note that Expedia packages are customizable from the ground up. Most competing services only offer a finite number of prearranged packages. Also be sure to catch the bonus package features under Expedia Sightseeing. With four

dozen cities both domestic and abroad, each sightseeing destination features booking options for everything from snowmobiling to whale watching to a Las Vegas wedding, right down to the chaplain.

Booking aside, Expedia is also overflowing with information. Choose from 360-degree images, over 450 destination guides, reviews, advice, and much more. Soon, there will even be .NET alerts that pop up from your System Tray and the addition of three stores for Disneyland, DisneyWorld, and Disney Cruises.

Without digressing into being an infomercial, it's important to note that business travelers, who make up 20% to 30% of the company's business, will find some handy tools at Expedia, too. The site's mapping functions are extensive and, in our opinion, better than MapQuest.



Don't spend your three days at sea crammed next to the boiler room. Use Expedia's cruise ship floor plans to see which spots are still available for booking and get details on the room's accommodations. (If you plan on indulging in the 24-hour pizza bar, we suggest the room closest to the gym.)

Expedia offers a Mileage Tracker for managing all of your frequent flyer miles, guides for how not to get bored at popular airports around the world, and Expedia to Go, a collection of services (partnered with AvantGo and TellMe) for getting everything from hotel phone numbers to flight status on your PDA and cell phone.

Interestingly, Expedia's take on mobile devices is that they are best used

for synchronization of key itinerary facts rather than real-time planning and booking. Bandwidth bottlenecks prohibit features such as 360-degree picture viewing, and the prospect of viewing a cruise ship's floor plan on a smartphone screen is ridiculous. As such, a lot of the enthusiasm companies such as Amazon.com showed for hopping on the wireless bandwagon haven't infected Expedia.

### Making It To The Top

In the mid-'90s, Travelocity seemed invincible. The company was well-advertised, easy to use, and aggressively priced. So how was Expedia able to power past its chief rival and take the heavyweight travel belt in the fourth quarter of 2001? According to Expedia, the company owes its success to three factors: technology, diversification, and marketing. This sounds like hype, but the underlying facts are noteworthy.

First off, the choice to build a new travel-booking infrastructure from the ground up was a huge advantage. Naturally, this set Expedia off to a slow start as the company first had to design the platform and then work out the bugs while its competitors continued to operate with existing services. But once Expedia's database system was stable and proven, new services could be added to the highly extensible platform without much trouble.

Travelocity and others are still shackled by reliance on outdated architectures that don't integrate well, resulting in a sort of Frankenstein approach that sacrifices efficiency. For example, airfare prices and seat availability come from entirely different databases. This is why Travelocity has had a difficult time quoting availability until just recently.

By diversification, Expedia means establishing direct relationships with air carriers, tour operators, and other vendors. Most competitors use Global Distribution Systems for such items, a step that introduces middleman markups and often only gives access to



## Interview With Suzi LeVine, Director Of Product Marketing At Expedia

**CPU:** If Expedia was so profitable, why would Microsoft want to sell it off?

**LeVine:** Why would Microsoft want to keep a travel agency? It was in the summer of 1999 when Rich went to a subsequent status review and business check with both Steve Ballmer and Bill Gates. Rich realized that Expedia was at a place where in order to be the world's largest travel company, the company needed to be out on its own. It needed to be a travel company, not a software company. So when he presented the idea of spinning Expedia out to Bill and Steve, he asked those guys if they wanted to be a travel company or a software company. Then he pulled out an International Association of Travel Agents card with Steve Ballmer's picture on it to emphasize to him that this was what being a travel agent is. At which point Steve finally said, 'You know what? Just go.'

**CPU:** How will Expedia leverage its relationship with USA Networks?

**LeVine:** USA has amazing travel assets, but they're also focused on convergence of information, entertainment, and digital selling. This will allow us to move beyond the PC screen and onto the television screen. Say you're watching Baywatch and you want to go to that place. You can book it through Expedia. That kind of thing.

**CPU:** Won't that require interactive TV?

**LeVine:** Well, yes. But you could also just have some kind of 1-800-CALL-EXPEDIA number on there. Think of Home Shopping Network. This is pie in the sky stuff, but some of it is already getting going.

**CPU:** Has online travel reached its maturity?

**LeVine:** Au contraire! I'd say that we've come a very long way, further than I think anyone originally anticipated. But in terms

of penetration, online ticket sales in the airline market alone last year were only 12% of total tickets sold. And we don't just think



about air-car-hotel. We think about your restaurant reservations, your shuttles, the shows, your suntan lotion. All of these things together represent what an individual has on a trip. And *that* number worldwide is \$3.7 trillion. Knowing that, and knowing that Expedia's book-

ings in 2001 was \$2.9 billion, I think we have a ways to go.

**CPU:** I get to my hotel and find that my double room has been booked as a single. Now what?

**LeVine:** Call 1-800-EXPEDIA, and you'll get hooked up with one of our 1,100 customer service representatives, depending on whether your question is about a hotel room, vacation package, cruise, or a flight. In the case of a hotel snafu, Expedia would possibly speak with the hotel proprietor to make sure you are accommodated as an Expedia customer above other customers they might have. Another might be that Expedia would look at any other inventory that might be in the area and offer to rebook you with some other type of compensation as well for your inconvenience. But at the same time, we would work with that hotel to make sure that if they are putting themselves in an oversold situation it is not Expedia customers who are affected by that. Or if you judge that you just don't want to be there, we'll refund your money.

**CPU:** Is the customer always right?

**LeVine:** To obtain some of the rates we have, sometimes there are additional restrictions, and, in some cases, consumers don't read everything we put in front of them, even though we use checkboxes to ensure they've read it. Still, by and large, we accommodate those customers' concerns.

flat rates, not specially negotiated deals. In addition, Expedia works to keep its marketing expenditures in direct proportion to its net revenue. Although this may seem obvious—don't let your sales efforts outspend your revenue—many companies engaged in the dot-com frenzy lost sight of this fact and paid the price.

Growth has always been steady for Expedia, but the company's most transformative moves were acquiring Travelscape and Vacation Spot in early 2000. Travelscape was an air wholesaler that also had sufficient volume in hotel bookings to negotiate its inventory directly with suppliers. Similarly, Vacation Spot handles 25,000 vacation rental locations, over 4,000 of which customers can book online. These two acquisitions not only broadened Expedia's volume, allowing it to command better discounts, but also gave the company the direct vendor relationships it needed to negotiate rates and not work from flat pricing models. According to Expedia, its competition has failed to make similar acquisitions. Travelocity has a partnership with Hotel Reservations Network, but this still leaves HRN setting the pricing and taking its cut.

### Still Many Roads

Expedia may be king for today, but online travel has plenty of contenders for the throne. For starters, Orbitz is now beta testing an ESP-like system, and Travelocity's "best fare finder" is the first of several forthcoming feature renovations that will attempt to put the company back on parity with Expedia.

Of course, brick-and-mortar travel agents, while hurt by online travel sites, are far from gone. When you want someone to meet you at the gate, have your steak prepared medium rare, and make sure there is a chocolate mint on your pillow each night, only a conventional agent will do. Expedia assures us, however, that they're working on the chocolates already. **CPU**

by William Van Winkle



## Coder's Corner: XML

# Giving The Web A Voice

**I**n Coder's Corner: XML, Ian Graham shows you how to program with XML. Ian is the author of numerous books pertaining to Web development, including "The HTML Sourcebook" and "The XML Specification Guide."

The Web, for all its multimedia parts, is still a pretty quiet place. Most of the time we read or view content, not listen to it. The idea of a voice-interactive Web may seem like a distant dream, but it's actually closer to reality than most people think. The W3C has an entire activity area ([www.w3.org/voice](http://www.w3.org/voice)) devoted to "voice activating" the Web. In addition, many commercial products already embrace these technologies, of which almost all are based on XML.

The core of this activity is the VoiceXML language. It was derived from several XML dialects (VoxML from Motorola, PML from Bell/Lucent, and SpeechML from IBM) that were under development in 1998 with the goal of creating a scripting language for describing user interaction with telephone-based voice interfaces (think "Press 1 to talk to customer support").

These parties realized that three similar, competing standards were a bad idea. In 1999, they joined forces to set up the VoiceXML Forum ([www.voicexml.org](http://www.voicexml.org)) to guide the development of a unified language, VoiceXML. The VoiceXML 1.0 specification was released in 2000, at which point the forum decided the W3C should guide the language's evolution. The W3C released a working draft of VoiceXML 2.0 in late 2001 and has been managing VoiceXML's evolution since.

VoiceXML supports the following features:

- **Output of synthesized speech (text-to-speech).** VoiceXML has tags that suggest how text should be spoken when played, such as `<voice gender="male" age="45">`, `<emphasis>` tags, etc.
- **Playback of audio files.** VoiceXML documents can reference audio files that will play, such as an introductory spiel you hear while on hold.

- **Creation of audio files (recording and file creation).** A VoiceXML app can record what a user says.
- **Logical mechanisms for controlling a dialog session.** A VoiceXML app can do different things depending on what the user says or the button she presses on a phone keypad.
- **Recognition of spoken input (voice recognition).** A VoiceXML app can recognize words or phrases a user speaks and select different behaviors depending on the words or phrases.
- **Recognition of DTMF (touch-tone dialing) input.** A VoiceXML app can detect key presses on a touch-tone phone, such as "Press 1 to continue" or "Press 2 for the main menu."
- **Telephony features, such as call transfer and disconnect.** A VoiceXML app can redirect the telephone connection to another line and another VoiceXML app or to a real person.

Note the phone-centric nature of these features. VoiceXML was designed to drive telephone-based interfaces rather than generic Web interfaces, such as browsers or PDAs. However, much work is underway to break free of these limits (see [www.w3.org/voice](http://www.w3.org/voice) for more details).

## How It Works

We can use the following simple document example to illustrate how VoiceXML works. The `main.vxml` document lets a user navigate by voice to three other VoiceXML documents. These documents in turn would contain up-to-date news, sports, weather information, and so on:

**main.vxml**

```
<?xml version="1.0"?>
<vxml version="2.0" >
  <menu>
    <prompt> You have three choices: <enumerate />
    <choice next="http://news.site.com/start
.vxml">News</choice>
```



```
<choice next="http://sports.site.com
/start.vxml">Sports</choice>
<choice next="http://weather.site.com
/start.vxml">Weather</choice>
<catch event="noinput"> Please say
one of the three choices: <enumerate />
</catch>
</menu>
</vxml>
```

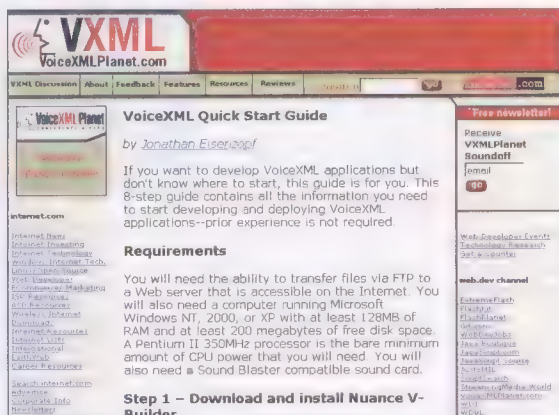
VoiceXML documents are read in and processed by a VoiceXML server. Such servers generally consist of VoiceXML interpreter software, additional software for voice synthesis (to convert the marked text into spoken words), and voice recognition, plus the required telephony hardware. Configuration files on the server associate specific VoiceXML files (referenced by URLs) with specific telephone numbers or extensions. When someone phones into a VoiceXML server, the server looks in the configuration file to find the URL associated with the number and downloads and runs the referenced VoiceXML file.

Because URLs reference VoiceXML files, they don't need to be physically on the VoiceXML server. They only need to be on a Web server the VoiceXML server can access. This is great because it means you can work with your VoiceXML (and other) files from your own Web site without needing access to the VoiceXML server.

To see how this all works, let's say someone dials the phone number associated with our example document. When she does so, the VoiceXML server downloads the file from the "configured" URL and loads it. The <menu> element defines a <prompt> and a set of <choices> to her. When the document loads, the server uses its text-to-speech synthesizer to dictate the content of the <prompt> element to her. Thus, after calling in, she will hear, "You have three choices: News, Sports, Weather."

Note how the <enumerate /> element enumerates through all the <choice> elements located inside the <menu> and adds the text content of those elements (the words "News," "Sports," and "Weather") to the prompt.

The application now waits for the user to say something. If the user says "News" (and if the server's voice-recognition software understands what she says) the VoiceXML server loads the referenced VoiceXML file and starts processing it. The current file, however, is unloaded. So in this example, once you select News, there's no going back for Sports. More sophisticated VoiceXML mechanisms let you retain this "grammar" of choices even when you switch to a new document.



VoiceXMLPlanet.com is one of many Web sites you can check out for guidance when creating your own VoiceXML apps. The site provides an eight-step guide to follow.

What if a user says nothing at all or something the software doesn't understand? The system will produce an application-specific default response, such as "I didn't understand what you said." In the former case, our example document has a <catch> element that catches the user not saying anything. The result is a prompt asking for a correct response.

### Take A Test Drive

Most VoiceXML companies provide demonstration voice portals. In particular, Tellme (www.tellme.com) hosts a phone number that lets anyone in North America test-drive VoiceXML applications. You don't actually see the XML, but you do get to hear how voice navigation and browsing works. To try it, visit the TellMe home page and follow the link to the demonstration pages, which provide explanations and the phone number (1-866-TELLME-1).

You can create your own VoiceXML apps at some VoiceXML developer sites.

You'll need your own public Web site for the VoiceXML and other data files you create. The company provides everything else, including a VoiceXML server and phone lines (you may have to pay long-distance charges to test your apps).

Most sites provide abundant documentation, tutorials, and downloadable utilities to help create VoiceXML apps. These let you build VoiceXML apps using drag-and-drop tools. However, most of these tools only work under Win2000 or WinXP. Few tools run under Win98/Me, Mac OS, or Linux.

Most companies are so helpful because they're looking to sell VoiceXML solutions to companies implementing voice portals or call centers. They see these development services as essential for supporting their current and future customers.

If you want to try developing VoiceXML, look to TellMe, Telera (www.telera.com/devxchange.html), VoiceGenie (developer.voicegenie.com), BeVocal (cafe.bevocal.com), or Nuance (extranet.nuance.com/developer). Also, try W3C's Voice activity area for VoiceXML development sites and tools. You'll also find

useful information at the VoiceXML site and at VoiceXMLPlanet.com.

### SALT To Spice Things Up

In late 2001, Microsoft and several partners announced the SALT Forum (www.saltforum.org). It aims to develop a new XML dialect focused on voice-activating generic multimodal devices (PDAs, Desktop browsers, etc.), rather than primarily on telephone interfaces.

The first draft of the SALT (Speech Application Language Tags) specification was released in February, with much overlap between its functionality and that of VoiceXML. SALT has yet to be deployed, but with the backing from Microsoft, Intel, Cisco, and others, there will probably be some SALT in everyone's future. Whether it's SALT or VoiceXML, the future of a voice-activated Web has never been so promising—thanks to XML. **COU**

by Ian Graham



# Web Design Workflow: Part I

**N**ow that you have the green light to begin a new Web site project, the question is where do you begin? How do you round up all the design and content ideas that have been floating around in your head—and in your client's head—and organize them into a logical, useable Web site? In this three-part series, we'll walk through the Web design workflow from start to finish.

## Collecting A Content "Wish List"

Before you dive into any Web design or redesign project, the first step is to sit down with the client or in-house team and interview them. In no particular order, make a "wish list" of all the features and content that they'd like to see in the new site. Make this a brainstorming session; you'll cull the list later when you get to the budget part! The client's wish list ultimately turns into, believe it or not, a site map that reveals the overall information structure of the Web site.

## Building An Outline

Once you've collected all the ideas, the next step is to begin categorizing and prioritizing them into a traditional outline form. Start grouping items that could logically go in the same category. For example "Company Overview," "Our Management Team," and "Career Opportunities" could all go under a general "About the Company" category. Some items from the wish list will be functions like a search or login box. I like to put things like this under a "Global Navigation" category because they are not content-related. Prioritize the information by putting the most important categories at the top of your outline.

What begins to emerge is a traditional-looking outline with numbered sections for each top-level category. Indented under each category is a list of content from the wish list, the "sub sections." As you go, keep in mind that each top-level category will ultimately become a navigation button. Each sub section becomes one Web page.

As you build the outline, you'll find some content sections that can be combined or eliminated

all together. Work with the client to refine the outline's categories and sub sections into ones that feel logical and doable within the given budget. One rule of thumb to enhance usability is to keep the number of main categories (not counting Global Navigation) between five and seven. If there are more than seven, the site will feel overwhelming because there is so much to choose from. Less than five, and the site will feel thin.

## Creating A Site Map

A site map is nothing more than a diagram that shows the information flow of a Web site. It's basically a visual edition of the outline you just built. With this in mind, it's not a difficult leap to see how important your outline is! Next

month, we'll dive into techniques for building a successful site map from your outline. For now, just concentrate on building a great outline!

## Resources

One resource I urge you to try is MORE

3.1. MORE is an outlining tool that helps you quickly build an outline—automatically numbering each category and sub section. Once you build an outline in MORE, you can click one button to see an instant site map! MORE is a little funky to learn, but once you do, it's a great tool. You can download it for free at [www.outliners.com](http://www.outliners.com). ■

### WARNING:

This article contains excerpts and concepts presented in "Web Design for Dummies." Don't let the name fool you; the book is designed for creative professionals, and it covers a lot of advanced Web design topics and issues. Plus, it's a fun read. P.S. Don't miss the great PDF resources at [www.lopuck.com](http://www.lopuck.com). You can contact Lisa at [lopuck@cpumag.com](mailto:lopuck@cpumag.com)

*Lisa Lopuck, [www.lopuck.com](http://www.lopuck.com), is a Web creative consultant helping companies define and plan their Web creative strategy, information flow, and visual look and feel. She is also the author of numerous best-selling books on Web design, including "Web Design for Dummies," and is a sought-after speaker at Web conferences and universities around the world.*



# mameme.txt



*Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.*

**A**re you feeling a little too mature for your own good, what with that job and perhaps a mortgage, or even, God forbid, children? Well let me propose a project that could make you feel like you're 12 all over again, with a pocketful of quarters and an afternoon to kill. I spent a lot of time in arcades when I was a kid and have always craved that experience in my house. Sure, you can buy a Ms. Pac-Man or Asteroids for a few hundred dollars, but nobody has enough room for all the games they want. Unless you get MAME.

I'm going to assume that you know about MAME already, but if you don't, visit [www.mame.net](http://www.mame.net) and learn about this nifty software emulator that runs the ROMs from all those classic video games from your youth. You can run it under many operating systems and find countless ROMs online. (You should be aware of the legal issues surrounding some games, but I'm not going to get into that here.) But running MAME on your PC isn't going to give you those flashbacks you crave. You know what I'm getting at: It's time to build your own MAME cabinet.

I'm sure you're thinking I'm crazy and that this task is outlandish, but it's actually remarkably easy. You can get a lot of hints about how I built mine at [www.cmdrtaco.net/jubei](http://www.cmdrtaco.net/jubei). Not only is it surprisingly easy, but if you have an old PII machine, you can build a MAME cabinet for fairly little coin. An arcade button only costs a little more than a buck, and a joystick costs perhaps \$10. [www.ultimarc.com](http://www.ultimarc.com) sells a simple little controller board for just \$40. You'll need some wire and a soldering gun, and you'll want to get some plywood to make the actual box to put it all in. We're talking about as little as a hundred bucks and you could be jousting to your heart's content.

Building this thing is remarkably easy. Each button has a simple switch that you connect to a ground line and back to your controller board. The board itself simply plugs into your computer's keyboard port. If you want to take things to the next level, you could look at [www.tmolding.com](http://www.tmolding.com) and get the plastic edging traditionally used on arcade cabinets. Likewise,

you could get a real arcade-quality trackball from [www.happcontrols.com](http://www.happcontrols.com). Missile Command and Centipede just feel so real when it's all hooked up.

If that's not enough for you, attaching a coin door and requiring your friends to cough up quarters for the rights to play your system is easy, too. Or you can do what I did and just make a button insert a quarter. Ever wanna finish Teenage Mutant Ninja Turtles? If you press the coin button a couple dozen times, you can beat the game with your eyes closed! You can see the endings to all those quarter guzzlers from your childhood that you lacked either the skills or the change to defeat. It's also just as easy

to add controls for a second player and relive those days of Street Fighter II and Mortal Kombat. MAME is even smart enough to retain high scores for many games, so you can put dirty words in the initial slots to your heart's content.

You'll probably need some software to wrap things all together, and there are a variety of excellent front ends to choose from. I wrote a nifty one available on [www.cmdrtaco.net/jubei](http://www.cmdrtaco.net/jubei) that will work if you're running your MAME under Linux. But there are a variety of others available for either DOS or Windows if that floats your boat. Some are even smart enough to power real arcade monitors, but you'll have a lot more flexibility if you stick to just using an old PC monitor.

You could do all this for a little more than a hundred bucks and perhaps a few Saturday afternoons. Of course, if you want to add a coin door, two-player capabilities, and a trackball, it'll cost a bit more. And if you use some nice wood and take care to stain it, you may end up with something that your significant other will let you keep in the house! Visitors to my house always love to take a whirl on the thing, each choosing a random game that was special to them when they were 12, and you just can't beat that. And if you charge them a quarter a pop, well you may just turn a profit! ■

**It's time to  
build your  
own MAME  
cabinet.**

*Get your MAME on and e-mail me at  
[malda@cpumag.com](mailto:malda@cpumag.com)*



# Your Profile



*Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment where she produced the two Cyberia games. Before 3-D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.Com, where she was co-founder and managing editor, Joan has retired.*

**Y**ou are identifiable by your face and fingerprints. But can you be identified by your preferences? If you subscribe to this magazine, that info is valuable and you are now a marketing target. (If you swiped this from your dentist's office, go subscribe at [www.cpumag.com](http://www.cpumag.com).) Fortunately, "Sandhills Publishing does **not** sell, trade, or otherwise release any personal information on our site visitors or subscribers," but that is not generally the case. Traditionally, your magazine choices are prized bits of personal info, so that subscription to *Little Bo Peep in Stilettos* online will probably end up in your profile, triggering another round of targeted marketing. But how accurate is this painted target? Let's start with the innocuous and work our way down to the ugly.

"You Are Where You Live."

Even information that is not personally identifiable is used in your profile. Take a quick look at this Claritas online demo ([www.yawyl.claritas.com](http://www.yawyl.claritas.com)). It claims to break down consumer populations into "lifestyle types" based on census data and consumer purchase records. Pop in your ZIP code to find out if you have been pegged a "Bohemian Mix" or an "Upstart Senior."

"What you bought in the past is the best indicator of what you will buy in the future." Thus many companies are dedicated to compiling your buying habits. Co-op databases like Abacus Direct ([www.abacus-direct.com](http://www.abacus-direct.com), a division of DoubleClick) are organized around the idea of customer data sharing. A business contributes its customer information to the database and is allowed to withdraw customer data contributed by other co-op partners. A scroll through the Abacus "Data Dictionary" reveals a list of 40 variables about you and yours before getting to the 86 lifestyle, 60 catalog product, nine retail, 12 publishing, 11 business-to-business, eight specialty, and five geographic categories. If you still think filling out that online product registration form is a good idea, get some privacy protection tips from the Electronic Privacy Information Center ([www.epic.org](http://www.epic.org)) or JunkBusters.com.

"They already know everything." Whether gathered online or off, information from data collection services can be combined and overlaid with public records, credit history, surveys, and census data to create a frighteningly complete profile. Mega database owner Experian ([www.experian.com](http://www.experian.com)) has

over 65 terabytes of data just on North America and covers 98% of American households. Every conceivable type of personal information can be found in some database, from your sock size to religious affiliation. Accuracy is another matter. One of my profiles contains 15 versions of my address. Some companies specialize, which is where things do get muddy. For example, one of Medical Marketing Service's ([www.mmslists.com](http://www.mmslists.com)) lists has detailed data on 16 million households that include sufferers of 69 different ailments. This list is updated monthly, can be selected by ailment, and is compiled using voluntarily completed consumer surveys. So the information leak just might be your mom.

While agencies of the government are prohibited from creating massive databases of individual profiles, we don't need a bunch of new legislation because data collection services have virtually no restrictions, and the government is allowed

to buy access to these enormous databases anyway. ChoicePoint, a major player in "pre-employment screening services," provides "decision-making intelligence" to businesses and government. Their online database customers include the FBI, DEA, and INS ([www.choicepointgov.com](http://www.choicepointgov.com)). In addition to consumer data, they provide access to billions of public records, including birth, marriage, and death certificates; court files; arrest records; property ownership and tax information; and driver's license, vehicle, and voter registrations. Compared to that, MediaPlayer 8 sending Microsoft your DVD list isn't such a big deal, now is it?

It swings both ways. Check your herding instincts at [www.google.com/press/zeitgeist.html](http://www.google.com/press/zeitgeist.html). While technology has provided new ways to collect and collate massive amounts of personal information, why can't all this data tell us something new about ourselves? Are we now classified and categorized to the point where nothing unique remains? Nah! According to Google, less than half of their 4+ billion queries each month are duplicate searches. In other words, while half of us are mass-pursuing tidbits about Brittany or the Taliban, the other half are asking questions no one else even thought to ask. Try profiling that! ■

*Send your favorite profile data error to  
[joan@cpumag.com](mailto:joan@cpumag.com)*

**MediaPlayer 8  
sending Microsoft  
your DVD list isn't  
such a big deal.**





**OUR 270-HORSEPOWER ENGINE CAN BEAT UP YOUR...WAIT,  
YOU DON'T HAVE A 270-HORSEPOWER ENGINE.**

**OnStar**

ON BOARD



Duch. The truth hurts. But it just so happens the 2002 Chevy<sup>®</sup>

TrailBlazer<sup>™</sup> is the world's most powerful midsize SUV.<sup>†</sup> The

driving force behind all this muscle? The all-new Vortec<sup>™</sup> 4200

six-cylinder engine that serves up an exhilarating 270-hp,

more standard horsepower than any V8 competitor. It also

## INTRODUCING THE ALL-NEW CHEVY TRAILBLAZER

dishees out a whopping 275 lb.-ft.<sup>‡</sup> of standard torque. Which

is more than (hey, big surprise) any six-cylinder competitor.

On top of that, you'll be able to tow up to 6,400 lbs. worth of

boat, trailer or anything else with or without an engine.

You'll get six-cylinder fuel efficiency.<sup>§</sup> And you'll get

smooth, quiet, refined engine performance,

thanks to the Vortec 4200's inherently

balanced in-line design. (See, extraordinary

power isn't *all* about brute force.) Test drive

a new Chevy TrailBlazer. After it, you'll find

that everything else just seems kind of weak.

**TRAILBLAZER**  **LIKE A ROCK**

†Based on 2001 EPA estimates. ‡Maximum torque ratings are calculated assuming a properly equipped base vehicle plus standard towing equipment. §Based on 2001 EPA estimates. ©2001 GM Corp. All rights reserved. TRAILBLAZER



# Road Warrior

## Brenthaven Makes A Strong Case, Palm Beefs Up, Virtual Displays & More From The Mobile Front

### A More Powerful Palm

PalmSource ([www.palmsource.com](http://www.palmsource.com)), Palm's new subsidiary, is setting to release arguably the most anticipated version of the Palm OS yet early this summer. Palm OS 5 is expected to introduce several improvements and features to the popular palm-sized OS.

One of the more anticipated features is support for ARM-based processors. ARM processors are much more powerful than the Dragonball processors that Palm OS devices now use. Although a 66MHz Dragonball version is available from Motorola, no Palm OS device currently uses a processor faster than 33MHz. By comparison, ARM processors now run as fast as 206MHz.

In addition to processor support, Palm OS 5 features an improved 320 x 320 screen resolution, double the current 160 x

160 supported resolution. The improved resolution isn't entirely new; the HandEra 330 and Sony CLIE versions feature higher-resolution displays. However, this is the first time Palm (or PalmSource in this case) has added such support directly into the OS. This will make support for higher-resolution displays available to all Palm OS licensees. For those

who haven't seen a CLIE or HandEra 330 with a higher resolution, it makes a noticeable difference.

Palm OS already includes support for Bluetooth, CDMA, and 2.5G/3G wireless networks, but support for 802.11b is noticeably missing. Palm OS 5 will fill that hole.

Security enhancements are also part of the new OS; 128-bit encryption will protect data and SSL and VPN support will encrypt information sent over the Internet.

Palm OS 5 should remain compatible with most newer applications. According to Palm, any application that utilizes the documented Palm OS 4.0 APIs will be compatible with the new OS and hardware.

### A Virtual Nomad

Most mobile users would gladly swap their mobile devices for smaller, lighter devices, provided that the features and performance don't change. However, certain physical characteristics limit how small a mobile device can get. For example, when a display reaches a certain size, it becomes impractical.

Microvision ([www.mvis.com](http://www.mvis.com)) just may have the answer. The company's Nomad is a small (18 ounces), head-mounted device that superimposes data in red coloring over a user's normal field of vision. The result is an 800 x 600 resolution display that's comparable to a 17-inch monitor. The Nomad remains visible in nearly any lighting condition, including direct sunlight.

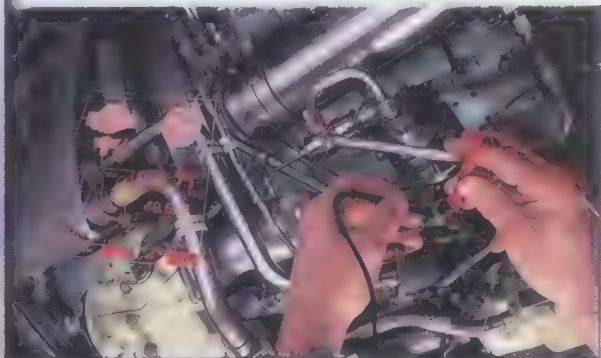
Microvision is pitching the Nomad for use in environments where high-situational awareness is essential, including flight lines, factories, and surgical rooms. It will take time for Nomad-like technology to become cheap enough to include in consumer devices, but it could provide some real benefits. Imagine, for instance, a Nomad-type display connected to a wireless network

providing GPS data and information about the immediate surroundings while you're driving, without requiring you to take your eyes off the road. Mobile-business users could use a compact folding keyboard and a Nomad-type display to edit reports or spreadsheets.

Some problems make virtual displays less than ideal for mobile electronics, however. Most mobile devices smaller than a notebook rely on a touch screen for navigation.

Obviously, you can't touch a virtual display. Plus, there's the social stigma of wearing such a device in public. Most of us would have to be extremely self-assured or socially inept to wear such a device. Either way, you're going to attract a lot of stares. We just want one that lets us watch "The Matrix" during our next staff meeting.

**Microvision's Nomad can superimpose an image over your regular field of vision. The image on the left gives you an idea of what you might look like, while the image on the right details what you might see.**





## Wireless Lovin'

The FCC ([www.fcc.gov](http://www.fcc.gov)) passed preliminary approval Feb. 14 for commercial devices that utilize UWB (ultra-wide-band) wireless technology. UWB can accomplish some nifty feats, the most interesting being the ability to see through walls. Of course, you can perform more pedestrian tasks with UWB technology, including high-speed wireless networking.

Until now, police officers, firefighters, and rescue workers have been the exception to the UWB usage restriction, using UWB devices to help fight fires and find trapped victims. The new ruling, however, paves the way for UWB devices to appear on the shelves of your favorite electronic stores.

UWB broadcasts small amounts of data over a very wide frequency range. The result is a signal that, in theory at least, produces little or no interference with other transmissions. The wireless spectrum is a limited resource, but UWB may provide a way to reuse some portions of the spectrum and help accommodate the growing number of wireless devices.

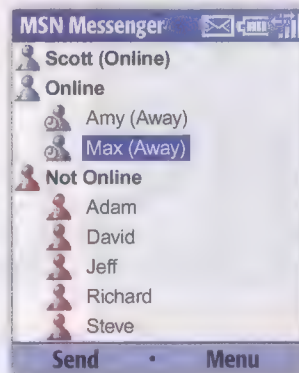
Some experts aren't quite as certain about UWB's ability to avoid such interference. The NTIA (National Telecommunications and Information Administration; [www.ntia.doc.gov](http://www.ntia.doc.gov)) made several recommendations that the FCC apparently took to heart. The result is what the FCC calls a "cautious first step" for UWB and is less than an unconditional green light for UWB. In short, the FCC placed restrictions on the frequencies within which different UWB devices can operate. For example, imaging systems that can see through walls must operate below 960MHz or between the 1.99GHz and 10.6GHz range, while networking and communication equipment must operate between 3.1GHz and 10.6GHz. Communication devices are limited to indoor use or confined to a handheld device. The FCC is planning to re-evaluate UWB in six to 12 months.

## TI, Redmond Is On Line 1

Microsoft's strategy has been summed up in two words, "Windows Everywhere." The phrase gets more appropriate every year. In fact, your next mobile phone just might greet you with Microsoft's logo. Microsoft's Smartphone 2002 software got a boost in February when Texas Instruments ([www.ti.com](http://www.ti.com)) and Microsoft released a reference model running Microsoft's software on TI's OMAP (Open Multimedia Applications Platform) processor.

The model uses the OMAP710, which combines a GPRS (General Packet Radio Service) DSP chip with an ARM-based processor for handling included apps.

Microsoft's Smartphone 2002 software is designed exclusively for mobile phones. The



Somehow we're not too surprised MSN Messenger and Windows Media Player are included with Microsoft's Smartphone 2002 software. These applications seem to bundle with almost every piece of software that bears a Microsoft logo these days.

software supports color displays and includes several common Windows applications, including MSN Messenger and Windows Media Player.

The reference model isn't available to consumers, but companies may use it as a starting point for producing a consumer product using both Texas Instruments' hardware and Microsoft's software.

## If That's The Case . . .

Unless you just want the freedom to compute from the couch, a good notebook case is essential. Even if you travel light, you need a place for your notebook, power supply, floppies, CDs, spare modular drive, and maybe an extra battery. Frequent business travelers probably have even more to lug around.

A number of cases will work, but the difference between a serviceable case and a good one can be extreme. Although high-end cases can cost several hundred dollars, higher-quality construction, more attention to ergonomics, and better design are usually worth the extra cash for those who travel frequently.

Brenthaven ([www.brenthaven.com](http://www.brenthaven.com)) has made a habit of producing good high-end cases for notebook computers. We examined the lower-end Deluxe Slim model up close and came away impressed. The fabric will

take a beating without getting torn or unraveled, and the removable sleeve that houses the notebook contains high-density foam and is designed to minimize impact as much as possible. We wanted to see just how good the protection was but our testing lab was reluctant to let us use the notebooks we had in for testing as guinea pigs.



**Brenthaven's Deluxe Slim notebook case is sturdy and offers excellent protection for your notebook. It includes plenty of pockets to store everything from extra modular drives to PC Cards and mobile phones.**

The Deluxe Slim had a place for us to stick all of our mobile gadgets. Larger storage pockets provide a place for bulky peripherals and power cables, while smaller pockets provide storage for PDAs, mobile phones, and computer media. The shoulder strap is designed to provide you with the maximum amount of comfort.

The Deluxe Slim is roughly \$275, which isn't bad for a quality case. Prices can run as high as \$425 for the company's wheeled cases.



# At Your Leisure



## Plug In, Sit Back & Fire Away

**T**he entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in game consoles, games, PCs, DVDs, and just stuff we love, read on.

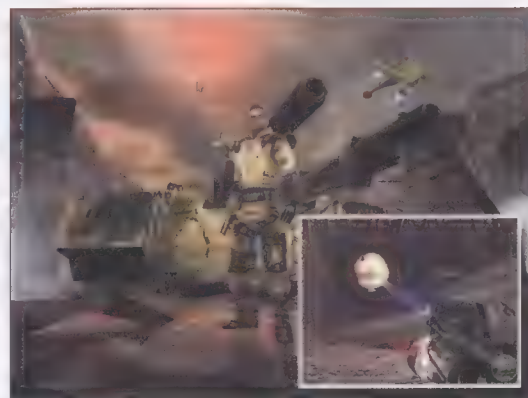
### Command & Conquer: Renegade Wreak Havoc On The Bad Guys

**W**e've been anxiously awaiting the release of C&C: Renegade (being developed by Westwood Studios) for a few years, and we're happy to see it finally on shelves. In this title, Captain Nick Parker (code-named "Havoc"), the GDI (good guys) commando from the hit Command & Conquer RTS games, loses his drawl and comes to life in his very own FPS. Havoc's dialogue is a bit banal, but it still manages to generate quite a few smiles.

Fans of the C&C strategy titles will easily recognize the structures and units in Renegade, which is part of the fun of this game. Most gamers should be able to

complete this game in a week-end without breaking a sweat. The simple plot, motivations, characters, and weapons are both good and bad: You can jump right in and play, but there is barely any replayability in the single-player mode, even at the hardest level.

Worse, Renegade's AI is disappointing; in fact, it's one of the worst we've seen in any major A-title. Your NOD (bad guys) enemies have a few basic thoughts: run, shoot, or sidle. This is not done very

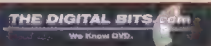


Renegade lets you drive a variety of C&C vehicles. Here Havoc and his GDI team penetrate the NOD defenses.

intelligently, and the enemy can usually be wiped clean pretty easily.

C&C: Renegade does not live up to the hype (but what does?) of the excellent C&C RTS name, but it *is* fun despite the AI problems. We found the game on sale for \$29.99 the week-end it was released. At that price, it was a good buy; the full-priced game is only a must-buy for C&C fans and hardcore FPS players.

### DVD Bytes by Todd Doogan



**W**hen two filmmaking greats put their heads together, you'll never know what incredible worlds may be created. With "A.I." we have a better idea, and on DVD we couldn't ask for a better representation. Dreamworks' new DVD is definitely reference standard; it features a beautiful anamorphic widescreen transfer highlighted



by an aggressive soundtrack in Dolby Digital 5.1 and DTS 6.1 ES. Pretty much everyone

knows the history of the film, shepherded for years by the late Stanley Kubrick, who essentially willed it to Steven Spielberg. But there's more to it, and documentarian Laurent Bouzereau expertly shows us that.

DVD fans know that insightful supplements on Spielberg

(or even Kubrick) films are few and far between, but this two-disc set is incredible. Every point about the film is covered in depth, including production design, interviews with cast and crew, and inside looks at conceptual art and unfinished sets through short featurettes totaling over two hours of footage. Any film fan will gladly pore through this special edition—and maybe walk away with a new appreciation for the film.

### Command & Conquer: Renegade (PC)

**\$49.95**

**EA Games**

**www.westwood.com**  
**/games/ccuniverse**  
**/renegade**



## Drakan: The Ancients' Gates Dragons Are A Girl's Best Friend

Following the lead of such mega-hits as Tomb Raider and Perfect Dark, developer Surreal Software's Drakan games for the PC (Drakan: Order of the Flame) and PS2 (Drakan: The Ancients' Gates) look to capitalize on the trend of strong female lead characters. Rynn is a hard-edged adventurer who travels from place to place smiting the forces of evil with help from her closest companion, a dragon named Arokh.

This third-person action/adventure game offers tremendous depth in terms of exploration and combat. In addition to riding atop Arokh's back in aerial combat, Rynn mixes it up on foot with a variety of melee and ranged weapons, as well as magical spells. The game is made up of a number of quests and the ultimate goal of opening four mystical gates to unleash Arokh's fellow good dragons in order to

stave off the epidemic spread of evil throughout the land. The game's world is large and fun to explore, and thorough explorers reap substantial rewards in the form of powerful weapons (there are more than 50 hand-to-hand weapons alone), scads of treasure, and plenty of nasty critters to take out.

Drakan: TAG complements a pretty good control setup with better-than-average 3-D graphics and a slew of engaging characters. Rynn doesn't exude a ton of personality (she's the strong, silent type), but Arokh has an intriguing blend of ancient wisdom and attitude, and many of the critters they battle are quite colorful, sometimes taking time to talk medieval smack during combat. The game's AI isn't quite on par with the AI of games such as Halo, but the variety of



Rynn and Arokh make a fearsome duo in the air.

enemy types (30 in all) helps provide plenty of tactics and attacks to figure out and fend off.

In short, Drakan combines some of the best elements of fantasy RPGs and action games and does so for hours upon hours.

### Drakan: The Ancients' Gates (PS2)

**\$49.99**

**Sony Computer Entertainment America**  
[www.scea.com/games/categories/action/advent/drakan/home.html](http://www.scea.com/games/categories/action/advent/drakan/home.html)

## State Of Emergency Uncivil Disobedience

An increasing number of video games these days let gamers play the part of the bad guy. The first really effective expression of this phenomenon may have come in 1996 when Crystal Dynamics unleashed a vampire protagonist named Kain on the gaming public; people found out how good



Not sure who T.J. is, but he's not gonna be happy when he sees what you've done to his sporting goods store.

Theft Auto series are all testaments to the popularity of the modern antihero.

Now there's a new twist to this saga. State Of Emergency, a VIS Entertainment-developed and Rockstar Games-published title, lets you perform chaotic acts of violence and mayhem, but for a noble cause.

A large corporation takes over running things in place of the government, and folks aren't too keen on the idea. Riots ensue, and an underground resistance organization (cleverly named Freedom) does its part to make trouble for the company. You

start the game playing as one of two characters (you can unlock three more as the game progresses), a male ex-cop or a female former district attorney. You'll take an active role in the growing unrest, destroying corporation buildings, taking out corporation security personnel, and inspiring as much chaotic violence as possible in a variety of locations.

You'll attack corporation forces with a variety of weapons ranging from meat cleavers to rocket launchers, collecting health power-ups and time extensions as you go. You can even perform a public service and whack a few armed gang members while you're at it, but the more damage you do, the more attention you'll get from the corporation and the gangs alike.

Although not quite as instantly or continually engaging as Grand Theft Auto III, SOE is an entertaining choice for gamers looking for some mindless action.

### State Of Emergency (PS2)

**\$49.99**

**Rockstar Games**  
[www.rockstargames.com/stateofemergency](http://www.rockstargames.com/stateofemergency)



No weapons? No problem. Just pick up the nearest park bench and huck it at someone.

it feels being bad, and the concept stuck. Sony's Twisted Metal: Black, Eidos' Soul Reaver games, and Rockstar Games' Grand



## Genma Onimusha Not Just Another Pretty Face

Sometimes publishers port their hit titles from one console to the next and make insignificant cosmetic changes just to drive sales among diehard fans who own multiple consoles. Capcom, however, avoids this faux pas in its update of the popular PS2 title, *Onimusha: Warlords*. The Xbox version, titled *Genma Onimusha*, is an update in every sense of the word, containing new areas, in-game cinemas, and monsters, as well as some new character costumes and a very cool tweak to the game's soul energy system.

*Onimusha* is the story of a roving samurai named Samanosuke, who charges in to rescue a princess (yeah, it's been done, but it works) held captive by the demonic forces that have overrun a Japanese castle. Samanosuke gets help in the form of a supernatural gauntlet, given to him by the mysterious ogre clan, which lets him absorb the soul energy of his defeated foes and unleash powerful magic attacks.

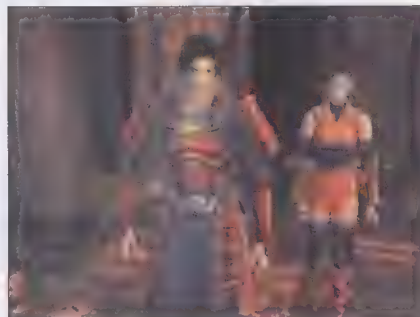
Like a number of third-person action/adventure games on the market today, *Onimusha*'s roots trace back to



A dangerous tug-of-war for green soul energy leaves Samanosuke momentarily vulnerable to attack.

Capcom's own *Resident Evil* series, but the traditional Japanese settings, music, costumes, and weapons give it a very fresh feel.

In *Genma*, in addition to absorbing yellow, blue, and red soul energy to power up your health, magic, and weapons, you can take in a new form of green soul energy. Green energy builds up as Samanosuke absorbs it, and when he has stored enough, gives him brief invincibility. This comes in handy when simultaneously taking on multiple foes, as often happens in *Onimusha*. But demons can absorb it,



Samanosuke and his faithful sidekick, Kaede, who is a female ninja.

too, and it makes them especially nasty. The result is often a supernatural tug-of-war between Samanosuke and a demon or two, adding a great new play element to the game's frequent and harried battles.

Capcom also gave the game a bit more bite. I found myself having to play through a number of the initial (and therefore "easy") battles several times until I grew accustomed to *Genma*'s ramped-up difficulty level, but this is a welcome change. In addition, the game's graphics are still among the best on the market. Any survival horror fan who hasn't played the PS2 version—and many who have—should get *Genma Onimusha*.

### Genma Onimusha (Xbox)

**\$49.99**

**Capcom**

**[www.capcom.com](http://www.capcom.com)**

## Independence War 2: The Edge Of Chaos Space Never Felt So Good

The 1990s were a good decade for space sims: *Wing Commander*, *X-Wing*, *TIE Fighter*, *Privateer*, *Freospace*, and more. And let's not forget the perennial 1980s classic space sims on which many of us cut our teeth (*Elite*). Unfortunately, the space sim genre is a dying breed. That's what makes Particle System's follow-up to its 1998 release, *Independence War* (known as *I-War* in Europe), such a gem.

You take on the role of Cal Johnston in *Independence War 2: The Edge Of Chaos*. You play the life of a space pirate: You'll explore space, fight other spaceships, and make money. Sounds simple, but it's not. *IW2* focuses a lot on the "sim" portion of



*IW2* is tough but rewarding. The characters are interesting and feature quality voice acting.

"space sim." The story line is intriguing, and the graphics are excellent. You can run the game at 1,600 x 1,200 with 32-bit

color, and it features plenty of cool 3-D effects. We daresay it ranks with the best-looking space sims out there; eye candy is not in short supply if you have a tip-top gaming rig.

*IW2* features realistic flight physics so you won't be doing banks and turns as easily as in other popular space sims, but there are numerous settings to select from that will ease ship control. Starting out at the most difficult level will take more time to learn but won't make you dependent on the in-game flying aids. This game doesn't handhold newbies, but stick with *IW2* for a few hours and you'll soon be hooked.

### Independence War 2: The Edge Of Chaos (PC)

**\$39.99**

**Infogrames**

**[www.independencewar.com](http://www.independencewar.com)**



# Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Who needs eye candy? Remember how awesome games such as *Alone In The Dark*, *Quake* (3-D accelerated on Rendition's Verite), and *Falcon 3.0* on a high-end i386 looked in their heyday? We know that great graphics don't hurt. There's nothing better than stellar gameplay combined with knockout graphics to make that killer game. These games have potential.



**Age Of Mythology (PC).** Ensemble Studios will return with the next game in its stellar RTS series this September. Now featuring an all-new 3-D engine, AoM will let players dominate a civilization when legends were as real as the mag in your hands.

**Dungeon Siege (PC).** Chris Taylor and his crew at Gas Powered Games are working on one of 2002's most hotly anticipated RPGs. *Diablo* players will be instantly at home with the game, but *Dungeon Siege* is not done. This hack-n-slash brute runs in 3-D and features seamless interior-exterior transitions, phenomenal graphics (see for yourself), a good interface, and excellent character development. *Dungeon Siege* should be hitting store shelves as you read this.

## Infinite Loop

### Don't Worry, Surf Happy



Internet users are a happy-go-lucky bunch. They're eternal optimists, always thinking the best is yet to come. Don't believe us? Check out these search results from Google. (No, we don't know what it means, either.)

Term	Number Of Sites
happy	17 million
sad	4.55 million
glass half full	1.05 million
glass half empty	440 thousand
good news	4.62 million
bad news	3.03 million
up	190 million
down	66.1 million
light at end of tunnel	417 thousand
train at end of tunnel	179 thousand
positive energy	1.46 million
negative energy	1.17 million



# QUERYING ACCESS

## Tips That Go Beyond Asking Politely

**Q**UERIES. THEY'RE SOME OF THE MORE IMPORTANT PARTS OF ANY ACCESS DATABASE. AFTER ALL, WHAT GOOD IS ALL THAT DATA

if you can't get your hands on it?

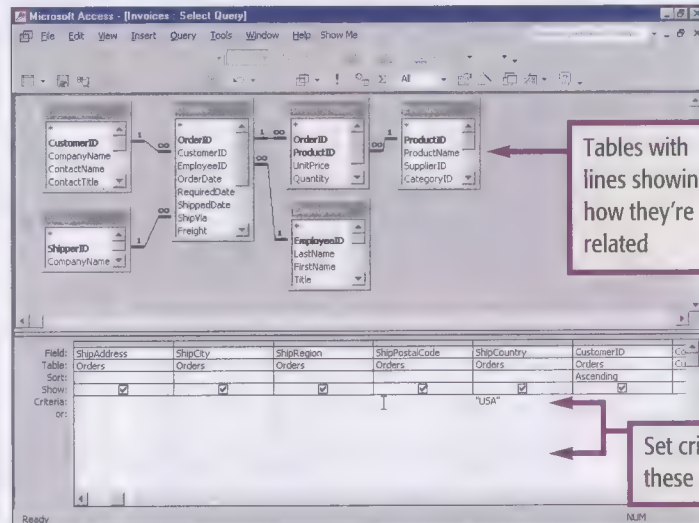
Of course, you already know that; you've long used the power of queries to get things done. But you want more. You want to wield Access' tools with greater precision and clout, muscle your databases into submission, and make queries show you only the information you want. Here we look at some tricks for working with select queries before delving into parameter queries and calculated expressions.

### Query Data From Multiple Tables

We'll assume you've designed a number of select queries throughout your career—the typical, everyday sort of query you use to select information from a database. But you may not know you can make these queries work faster and better just by following a few tips.

Here's one: If you've designed your database correctly, you've also created relationships among several tables in the database, linked by common fields. This means you can grab information from each of the tables, picking and choosing the specific fields you want. To grab fields from multiple tables, first create a query in Design view. (Click the Queries button in the Database window and then

choose Create Query in Design View.) When you do, the design grid for your query is displayed, and the Show Table dialog box automatically pops up. (If you're already working with a query in Design view, click the Show Table button to do the same thing.)



You can add several tables to a query and then choose fields from each.

In the Show Table dialog box, double-click the table(s) you want to add to the query, and a field list for each will appear in the top pane of the design grid. If you accidentally add the same table twice or decide you want to remove a table from the query, click it in the upper pane of the query window and then press DELETE.

Here are a few quick ways to add fields to the query design grid after you've added

the tables you want. Double-click the field in the table's window to place it in the first available column in the grid. Alternately, drag and drop the field from the list into the grid. If you don't want to scroll through a long list of available fields, click the field list and then press the first letter (or two) of the field you want to select it. Better yet, you can also select multiple fields on the list and add them all at once to the design grid.

When you're finished adding the fields to the design grid, click the Run button and Access will show the results in a query datasheet.

### Make A Match

You've already seen how to limit the fields in a query: just choose the specific ones you want from the field list. But you can also limit which records a query shows by setting criteria and asking for an exact match for the criteria. To do this, click in the Criteria cell for the appropriate field in the design grid and then type your criteria. For example, if you want to see only those clients who live in Virginia, type VA in the Criteria row for the State field.

Access usually figures out if you're entering text, dates, or values as criteria and

treats them accordingly. Access adds double quotation marks around text you enter; pound signs (#) indicate dates and values. Of course, if Access messes up and doesn't add the correct symbol automatically, you can type it in manually.

### Cast A Wide Net

When you enter a specific item (such as "VA" or #1/1/2002#) in the Criteria row



# Working With Calculated Expressions

To dig even deeper into calculated expressions, take a look at the following examples and enter them in a sample database, such as the Northwind database that comes with Access.

To . . .	Use This Expression . . .
Give everyone in your department a 10% bonus	[Salary]*1.1
Determine when employees will be eligible for insurance (60 days after starting work)	[StartDate]+60
Display a person's first and last name in one field	[FirstName]+ " "+[LastName]

for a field, Access will search for and find an exact match in the database. For example, if you type **Smith** in a Criteria cell for the Last Name field, Access will only return records with Smith in that field.

You can expand your query with a wildcard character. Yeah, that familiar-from-the-DOS-world asterisk character still indicates "any number of characters" when you use it in an Access query. Using a wildcard character is a good idea if you even remotely suspect that your data entry people carelessly mistype data or you're not sure how a particular name is spelled. You can type **S\*** in the Criteria row for the Last Name field to display all the people with a last name beginning in S: Simon, Smith, Siger . . . well, you get the idea.

## Operators

To further control which records return when you run a query, you can use some of Access' built-in operators with the criteria you set. Here's a run-through of the more helpful:

**Between . . . And.** Access includes this operator so you can use "real English" to specify records in a range, such as everyone whose salary is between \$40,000 and \$100,000. You can also use this operator to specify records that use dates, such as **Between #1/1/2001# And #1/1/2002#**. (Access will add the pound signs whenever it recognizes a date field, so you don't have to mess with them.) This is also a great operator to use to indicate a range of values, such as **Between 2500 And 8000**. Finally, you can use this operator to pull out records based on the first letter in a given field: Typing **Between D\* And L\*** will

display all records for last names that start with D through L.

**Not.** This Access operator lets you display all records except those you indicate. For example, imagine you're having a party and decide to invite everyone except for the Sales department. In the Department field, you'd type **Not Sales**. Another example would be if you want to send a mailing to everyone except people in Ohio. Then you would enter **Not OH** in the State field.

**Is Null.** Why would you want to display records where a particular field was blank, or null? Well, to find out which orders haven't shipped or which employee hasn't yet taken a vacation this year. To do this, type **Is Null** in the field's Criteria cell.

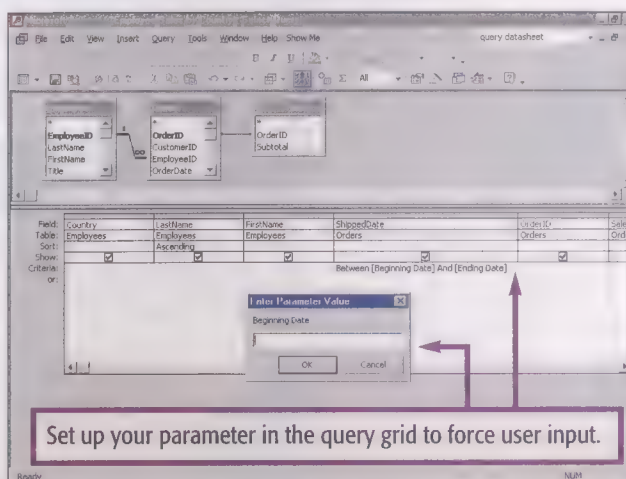
**Greater Than (>), Less Than (<).** These classic comparison mathematical operators help you enter a range of numbers. For example, you can type **>100000** to find all records with values greater than 100,000. (Just keep in mind that 100,000 won't actually be included in the results; you'd need to use the equals sign with the comparison operator, such as **>=100000**, to do that.)

You can also use the comparison operators to enter a range of dates. To find all the items shipped after June 15, 2002, for example, you could type **>#6/15/2002#** in the Criteria cell for the Ship Date field.

Finally, you can use these comparison operators to pull out records based on text fields. How many times, for instance, have you wanted to grab records for customers with names from L through Z? Here's the trick: Type **>L\*** in the Criteria row and Access will return all records with last names starting with L through Z.

## Go Straight To The Top

Another way to put your query in hand is to display only the top percentage (or the top values) in a field, such as the top 10 salespersons for the year or the 25 best-selling items in your store. Just create your query as usual, making sure to include the field for which you want to display top values. Click in the Criteria cell for the field, and then click the Top Values box on the toolbar. Enter the number of values you



Use parameter queries to change criteria as you go.

want to see (such as 15). If you want to instead use percentages, add the percentage sign to the number (10%).

## Calculated Expressions

Now you're ready to break into a whole new world of queries: using calculated expressions in a field. Calculated fields are handy when you want to find out the difference between two dates, display a customer's full name, or mark up an item's price by a certain percentage. Instead of reflecting a table's data, a calculated field shows the results of the calculation. Better yet, the expression is recalculated each time the query is run, so that only the latest



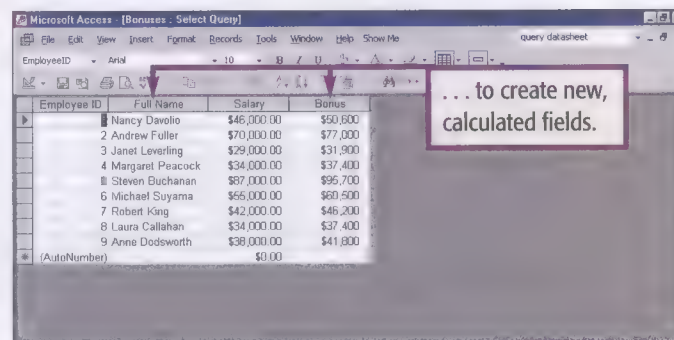
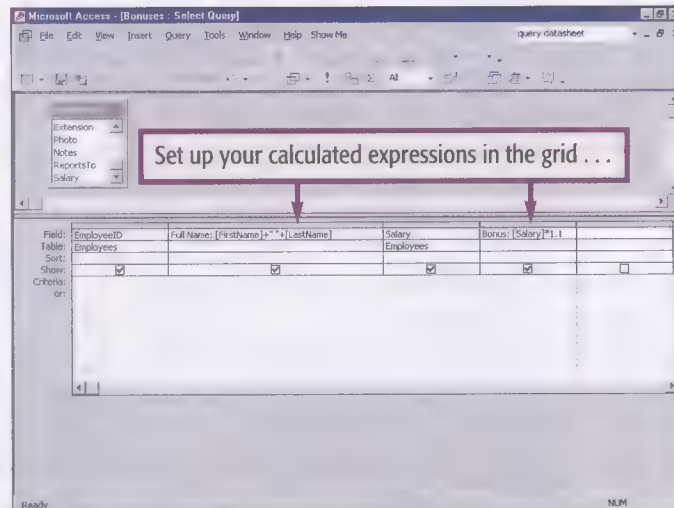
information is shown. You're not limited to calculating only numbers, either. You can use expressions in fields to perform calculations on text, numbers, or dates.

Here's the good news: Expressions in the query grid are set up pretty much like Excel formulas, using any combination of operators and fields. So if you're already an Excel geek, creating calculated expressions in Access will be a snap. `= [Subtotal] + [Shipping]`, for instance, calculates the cost of an item plus shipping.

Give calculated expressions a whirl by creating a new field in your query that shows an item's price times the quantity ordered: Type the name for the calculated field in the Field row of the query grid, followed by a colon. This assigns a name (such as `Total`) to your new field. After the colon, type your expression, placing the fields from the table between brackets: `= [Price] * [Quantity]`. Run the query to create a new, calculated field that shows in your query's results.

### Create Queries On The Fly

OK, now you're ready for parameter queries. This is a specialized type of



If you're familiar with using formulas in Excel, you'll have no trouble using Access' calculated expressions.

query that prompts you for criteria information and then shows records based on your input. When would you use such an animal? To pull up a specific customer or inventory item or to grab records that fall between two dates.

Parameter queries let you keep the basic query structure intact but give you the flexibility to change criteria on the fly.

Imagine, for example, you regularly pull up information about specific, individual customers. Instead of designing one query for Smith, another for Jones, and so on, you can have a parameter query prompt you for the customer's name and then just bring up only that customer's record. Here's how: Create your query as usual in the Design Grid, making sure to include the field for which you'll be prompted for information. In the Criteria cell for the field, type the prompt statement between brackets: `[What customer do you want?]`. Run the query, and a dialog box with this statement will flash on the screen. Enter the customer's name in the dialog box, press ENTER, and Access will show only the records that

match your criteria.

Now let's make life more interesting: set two parameters so Access prompts you for a starting and ending date. The query results will show only those records that fall between the dates. Of course, you can do this by using the `Between . . . And` operator along with a parameter query. For example, to see which items were shipped between two dates, type the following in the Ship Date field's Criteria row: `Between [Enter the Start Date:] And [Enter Ending Date:]`. When you run the query, Access displays a dialog box asking for the start date, then a second dialog box prompting for the ending date. Assuming you enter valid dates in each dialog box, the query results will show all shipments between the dates you entered. **cpu**

by Linda Bird

## Infinite Loop

### Growing Pains

Forget about urban sprawl. It's the age of computer game sprawl. You may recognize the encroachment of MP3s, digital video, and Office XP on the vast steppes of your 100GB hard drive, but maybe you should worry more about all those games you install.

Fifteen years ago, entire games for Commodore 64 computers often fit in just 160KB or less. And just 10 years ago, most DOS computer games came on one or more 1.44MB or 1.2MB floppy diskettes.

Today, you could fit approximately 200 of those old DOS games on a single 650MB CD-R. In contrast, a single recent game, the sprawling *Baldur's Gate* takes up five CDs by itself—and that's still less data than a 4.7GB DVD-R will hold. Tomorrow's high-res games could finally make DVDs the new software distribution paradigm.



# PROOF

THAT *great* IDEAS  
GET HEARD.

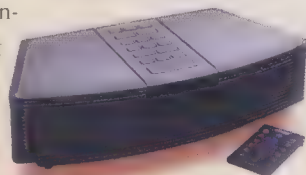


HONORED BY FORBES ASAP for CHANGING THE WORLD.

*Forbes* ASAP magazine rates the **Bose® Wave® radio** right up there with the light bulb, the compact disc and the telephone. Only fifteen inventions made their exclusive "All-Time A-List" of technology breakthroughs that have changed the world, and the Bose Wave® radio is one of them.



Recognizing products "both functional and beautiful," *Forbes* ASAP credits Bose with managing to fit "really big sound into a really small – and pretty – package."



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Payment plan available on credit card orders only and subject to change without notice. Quote: *Forbes* ASAP, 11/27/00.



# WARM UP TO PENGUINS

## Put Linux To (Net)work

**I**N APRIL'S ISSUE OF COMPUTER POWER USER, WE PRESENTED TIPS FOR USING LINUX GUIs, SPECIFICALLY KDE AND GNOME. THIS MONTH, AND IN MONTHS TO COME,

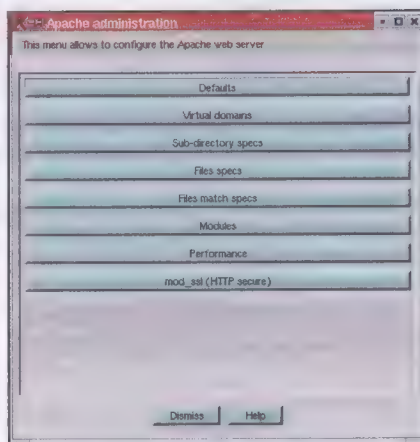
*we delve into more Linux issues and projects. This month, we focus on networking with Linux.*

A few years ago, configuring a Linux system for network access was a job that required a fair amount of patience and knowledge. If you wanted to do anything complex—such as use your Linux box as a gateway, a router, an end for a VPN, or a server for TCP services—you needed even more patience and a lot of time to experiment. In those days, it wasn't impossible to need an entire book on Linux networking.

Times change. Configuring Linux for most networking tasks today is relatively easy, requiring not nearly as much technical knowledge as once was the case, especially for simple tasks. Nearly anything you could want to do with a Linux machine—including setting up a network card, configuring proxies, and installing forwarding mechanisms and protocol converters—is often now as easy as selecting choices from a menu and providing basic information. Configuring hardware has become almost a brainless operation via autodetection systems that find and configure the network cards and other devices for you.

We could occupy pages with details concerning the basic steps of setting up and configuring a network using older versions of Linux, but because most of us now use current Linux releases, we'll focus on how to install and configure networks and network components using current distros. If you are running an older version of Linux and need more information, there

are many Web sites devoted to networking, as well as several excellent books on the subject. You can try the Linux Review ([www.thelinuxreview.com](http://www.thelinuxreview.com)) and YoLinux ([www.yolinux.com](http://www.yolinux.com)) sites for starters.



Manually editing Apache configuration files is time-consuming and can require a considerable amount of Linux knowledge. Fortunately, front-end GUI tools, such as this one, let you set up configuration files with ease.

### Up & Running

Because most of us already know essential networking basics (such as installing a NIC and understanding what an IP address does), we'll skip the basic tutorials. Most network cards that Linux supports these days are PCI-based, although most Linux distros support a few legacy EISA/ISA cards. The EISA/ISA cards are usually not detected automatically with the configuration routines, so you will have to manually enter

I/O address and IRQ/DMA information in most cases. If you do have an old EISA/ISA card around, don't be reluctant to use it in a Linux machine; it will work well as long as you have a driver for Linux. Most standard types of these cards have drivers available because the cards were the norm when Linux networking was originally developed.

After installing a PCI-based NIC in your Linux box, you can let the hardware detection wizards find the card and configure it for you. If you have already loaded Linux, you may have to manually start the hardware configuration wizard. If the card is already installed when you load Linux from scratch, the hardware detection wizard will notice the NIC and prompt you for networking requirements during the installation process. Either way, Linux wizards can automatically detect most PCI NICs currently available because many of the cards are simply OEMed from the same manufacturer or rely on the same chipsets. If your network card isn't detected, you will need to provide a Linux driver. Keep in mind that many other drivers may work with your card because of common chipsets.

You can also employ multiple NICs in the same Linux box. Most Linux distros easily support four NICs, and some allow many more. Again, the autodetect systems can usually find all the cards in your machine and configure them properly. If you do employ two or more NICs, some distributions let you identify which card to use for a particular purpose.

### Protocols & Services

Although TCP/IP is the most widely used protocol for Linux, you may need to configure other protocols on your Linux machine at some point. Fortunately, Linux can use practically every protocol in common use today, and Linux can handle several protocols at once.



## Let's Samba

**M**any of us have various operating systems on our LANs, usually a mix of Windows and Linux. You can share files and resources between Linux and Windows machines several ways, including using NFS, although you need to configure the Windows' clients to properly use NFS. Linux offers a better option for resource sharing via the use of Samba.

Samba, named after the SMB (Server Message Block) protocol, lets Windows machines read Linux file systems and lets Linux read FAT-formatted Windows file systems. Samba also lets you share resources, such as printers and modems. Microsoft originally developed SMB to permit resource sharing on peer-to-peer networks. To implement SMB for Linux, a pass-through service for the SMB information was developed and incorporated into TCP/IP.

Samba for Linux is composed of several components, all of which are included with current distributions. The primary Samba component is the `smbd` daemon, which provides SMB translations. The `smbd` daemon reads a file called `smb.conf`, which contains information about the resources that will be shared and any limitations on access. The other part of Samba is the `nmdbd` daemon, which provides NetBIOS-compatible name service and browsing from Linux to Windows machines and vice versa.

Samba installs the same as other Linux software and is often an option when you install a Linux distribution. (Some distros install Samba by default, although you may not be aware that it's active.) Configuring Samba can require some manual tweaking of the `smb.conf` file. However, the file is simple in layout and those with basic knowledge of resource and machine names can easily edit and set it up. Alternatively, some distros, such as Mandrake, provide a GUI-driven interface that lets you select the options of sharing printers, files, and other resources, generating the `smb.conf` file for you. ▲

You can install IPX/SPX (Internetwork Packet Exchange/Sequenced Packet Exchange) for connections to Novell NetWare networks (and play some multiplayer games that use only IPX), as well as AppleTalk for connection to Macs. You can run NetBIOS/NetBEUI for interconnection with Microsoft networks, allowing the use of Samba (see "Let's Samba" for more information) and other utilities for resource resolution. Finally, there are protocols to connect to DEC, Wang, and IBM networks that haven't migrated to

TCP/IP. Configuring protocols other than or in addition to TCP/IP is often as simple as selecting the protocol from a menu list on a configuration wizard.

You can install a wealth of TCP services on your Linux machine. The most commonly used server-protocol services are DHCP, which provides IP addresses to machines when they boot, and DNS, which resolves machine names into IP addresses. Other protocol services you can install include BOOTP (Bootstrap Protocol, a simple form of DHCP), but most of these are now obsolete or seldom used.

You can configure your network to support other services, including FTP server, Web server, and mail server configurations. Again, wizards will guide you through the selection of the proper protocols and configure your machine with a minimum of operator intervention.

Setting up your Linux machine as a Web or FTP server is straightforward. Often, you are presented with the option of installing these server processes when you install the networking component of a Linux distribution. Alternatively,

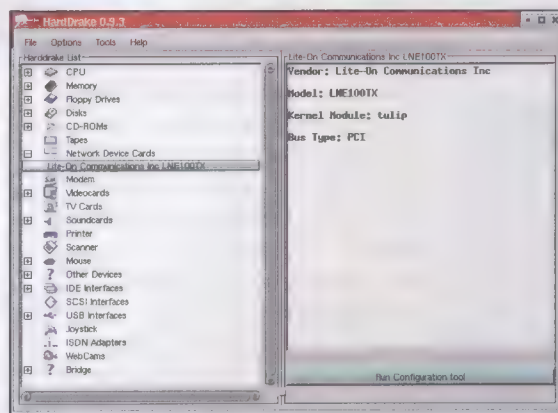
you can load the servers individually using standard software installation routines.

Running a Web server usually means running Apache, which can be easy to install and configure for routine Web server tasks. Apache is a complex package, though; in some cases, it can require many hours of tweaking and configuration file editing to fully customize.

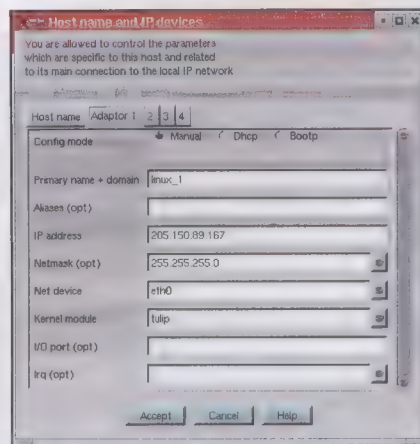
FTP servers let Internet users or users on a LAN connect to your machine and drop off or retrieve files. You can run an FTP client on any Linux machine with the server component, but you need to run the FTP server to actually let people move files from your machine.

### Gateways & DHCP Servers

As most of us know, a gateway sits between a LAN and the outside world, usually the Internet. The gateway handles

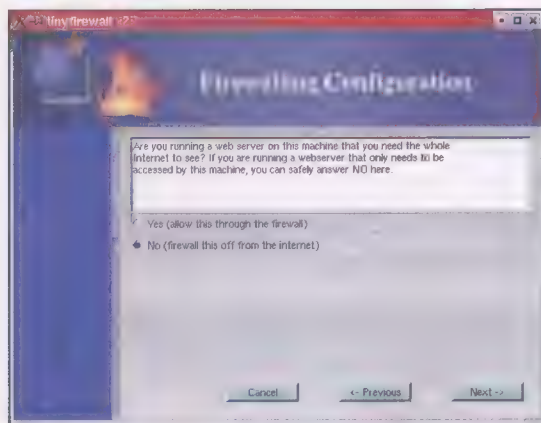


Many Linux distros include configuration and detection tools. The HardDrake tool, included with Mandrake Linux, lets you configure network cards manually, as well as change existing configuration information.



A simple network configuration includes one NIC with an assigned IP address. In this case, Linux automatically detected the NIC, assigned the standard driver (called tulip), asked for an IP address, and saved the configuration. The choices at the screen's top let you obtain an IP address from a DHCP server instead of hard-coding an address.





Mandrake Linux includes a personal firewall package that takes less than two minutes to install and configure, simply requiring you to answer several questions.

NIC, a modem, or other device, such as a router or dedicated phone connection.

There are two ways of telling the machines on the LAN that the Linux machine will be the gateway. The first is to manually configure the IP

traffic coming into the LAN from the Internet, directing it to the proper location. Usually there is some security setup, such as a firewall or packet filter, sitting on the gateway machine to provide security for the LAN. For traffic going out of the LAN to the Internet, the gateway makes sure the traffic is properly formatted as it directs it to the Internet, transparent to the machines on the LAN. The gateway can also act as a proxy, hiding user and machine names and IP addresses from the outside world.

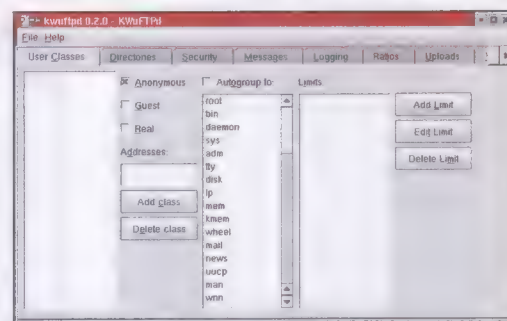
Configuring Linux as a gateway is relatively straightforward. You need a link to the LAN, usually a NIC, and a link to the Internet, which could be another

address of the Linux machine in all the TCP/IP configurations on the LAN. Each machine usually will have a hard-coded IP address when using this method.

Another way is to employ a DHCP server. DHCP assigns an IP address to each machine on the LAN and keeps track of which machine has which IP address. When sending data through the gateway, the DHCP server handles the address translation and routes packets properly. DHCP does impose some network overhead (as much as 5% with a busy network), but it's the easiest method to use, especially when

you temporarily add machines, such as notebooks, to a network.

Installing a DHCP server on your Linux machine is as simple as informing Linux through configuration that you want to install and run that server. You can then configure the IP addresses for machines connecting to the DHCP service, as well as how long those addresses are valid, which are known as leases. Each machine on the LAN then is told to use DHCP. When a machine boots, it connects to the DHCP service and requests an IP address.



Setting up an FTP server is simple, although you should carefully consider security when doing so. If you opt for anonymous FTP support, make sure you restrict the directories to which visitors have access.

Configuring the gateway software is usually as simple as selecting the type of security level you want to impose. In higher-security levels, traffic coming into the gateway is heavily filtered and some packets rejected. You can set the rules for the filter's behavior any way you want using GUI-driven tools available in most current Linux distros.

## Wrap Up

The days of complex network configuration processes for Linux are long gone, thanks to advances in autoconfiguration tools and GUI front ends to many network services. A newcomer to Linux can easily configure a server with many network interfaces, as well as protect the system using firewall software. Manual editing of files is still required at times, of course, but the task of creating gateways and firewalls for networks has been greatly simplified. In short, networking is no longer a scary consideration for Linux users. **COU**

by Tim Parker

## A Look At Linux Firewalls

**F**or some users, firewalls are the main lines of defense between their machines and the Internet, watching all the traffic coming in and out and filtering out anything that looks suspicious. The way in which the firewall is configured dictates which packets can pass through. For example, you can decide to reject any attempt to Telnet or FTP to your machine, or you can allow FTP requests under certain conditions. You can select which attachments to e-mails are acceptable, and so on.

If you want to configure your own firewall from scratch, a lot of information is available on the Web, including [www.linux.doc.org](http://www.linux.doc.org). The documents you'll find there explain the underlying theory and handling of subjects such as IP chains. If you don't want to configure a firewall yourself, many excellent commercial firewall products are available, although some are very expensive. A solid free firewall is T.REX from Freemont Avenue Software ([www.open.sourceforgefirewall.com](http://www.open.sourceforgefirewall.com)). For a

reasonably priced commercial firewall, check out the NetMax ProSuite (\$279; [www.netmax.com](http://www.netmax.com)) from Cybernet Systems. X Sentry Firewall from Trustix ([www.trustix.com/products/xsentry](http://www.trustix.com/products/xsentry)) is more complex and expensive, but also more secure (\$780 to about \$4,000). For complex firewall products that are suitable for large organizations, Check Point offers Firewall-1 ([www.checkpoint.com](http://www.checkpoint.com)), a port from its Solaris firewall product. ▲



# KILLER HARDWARE TIPS

## Too Cool To Follow Rules

**I**F YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON. WE HAVE

some tips and tricks that just might help your system look cooler and make you more productive.

### C: For Yourself

For most of us, hard drives are an enigma. The stuff inside a working hard drive—platters spinning at 7,200rpm and spindles flying back and forth—is sealed in a black-box world. Although we have an idea of what goes on inside those metal cases, it just doesn't seem fair that we can't see the action for ourselves.

Well, a handful of daring users have taken it upon themselves to remedy the situation, replacing their hard drives' opaque covers with transparent ones. Coupled with a PC case window, a transparent hard drive cover can be an unusually cool modification.

Fred Chou, a high school senior residing in Indiana, has replaced the covers of several hard drives, the first about three years ago. His first drive modification took about a month, including research and testing time—and he destroyed two drives refining the process.

The procedure involves opening the hard drive, removing the top of the case, and cutting an opening in the lid with a rotary cutting tool. This leaves a frame. Next comes cutting a sheet of rigid plastic to the correct shape to cover the hole, seal the plastic to the frame, reassemble the drive case, and you're done. Chou has a Web page that describes the procedure at [www.bp6.com/pics/holodeck2/reviews/hd%20mod/hd.htm](http://www.bp6.com/pics/holodeck2/reviews/hd%20mod/hd.htm). Another how-to is

available at Overclockers.com ([www.overclockers.com/tips821](http://www.overclockers.com/tips821)).

Chou says he has had "no problems whatsoever" with his modified drives, but industry experts say it's only a matter of time.

"It's a really bad idea to open your disk drive, and a really worse idea to replace the cover," says Martin Parry, senior product and marketing manager at Maxtor. "Disk drives today are made with exquisite precision and tolerances. Even the most microscopic contamination can cause mechanical damage and data loss."

Unless you'll be hacking up your hard drive in a clean room wearing a bunny suit, the primary problem with opening a hard drive is particle contamination, primarily in the way of airborne dust. Specks as diminutive as half a micron to 2 microns in size can wreak havoc, gouging the surface of the disk platter or building up around the read/write head.

"The spacing between the head and disks is critical. The head slides over the surface of the disk. If the head hits a particle, it will embed the particle into the surface of the disk, destroying the drive," says Serapio Ayala, director of chemical and integration laboratories at Seagate.

"For each new generation of drives, as we get more capacity, the heads are flying lower and lower in order to achieve that," Ayala says. As a result, ever-smaller particles can damage a drive. If the drive survives the initial spin-up and cleans itself, the case can still hold trapped particles, which can get knocked onto the platters months or years

later due to electrostatic discharge or simply by you moving the PC.

Static electricity is another big issue. The allowable discharge a drive head can take is less than 20 volts, but you can deliver a shock of 5,000 volts to 10,000 volts (more than enough to destroy a hard drive) just by shuffling your feet on the rug, according to Ayala.



If you're willing to take the risk, modding your hard drive will let you see what's happening inside—unless it never works again.

An esoteric side effect to using some types of plastic for the case is "out-gassing," a phenomenon caused by compounds being released from the plastic and condensing onto the surface of the disk platters. A glass cover is more difficult to install but isn't prone to that particular danger.

If you're going to throw caution to the wind and modify your drive, do what you can to make the process a bit safer. Wear an antistatic strap and ground yourself. Limit the amount of particulate matter that your body leaves behind by wearing gloves, a cap, and mask (think of a surgeon headed to the operating room). And remember to back up your data regularly forever after.

Neither Maxtor nor Seagate has plans to manufacture a clear-case drive, but "Who knows? It might be something that comes around one day," says Maxtor's Parry. "As we've seen with some of the



Macintosh products, the use of transparent or colored plastics can make a real visual statement. At the moment, I don't see a real functional need or strong market benefit to doing it."

So, for now at least, folks who want a clear drive must take the task, and risk, into their own hands. "Yes, it's foolish, but it's my nature to take things apart that aren't supposed to be taken apart," says Chou. "Don't say that it shouldn't be done or can't be done unless you have tried it."

### Check Out My (Mouse) Pad

When you think of high-tech hardware, mouse pads probably don't spring to mind. However, maybe it's time you think about upgrading yours. A number of manufacturers have gaming pads available, which feature surfaces that provide better control than cheap foam pads.

Choices include pads from Everglide ([www.everglide.com](http://www.everglide.com)), Logitech's WingMan Gaming Mousepad ([www.logitech.com/cf/products/productoverview.cfm/34](http://www.logitech.com/cf/products/productoverview.cfm/34)), Ratpadz ([www.ratpadz.com](http://www.ratpadz.com)), and fUnc Industries' Surface1030 ([www.func.net](http://www.func.net)). These pads are expensive relative to the free-with-your-fries foam mouse pads, costing anywhere from \$14.95 for Logitech's pad to \$19.99 for the Surface1030.

The primary benefit of these pads is a high-traction surface that offers more precise mouse control. Another advantage is surface area. Mouse pads such as Everglide's Giganta and the Ratpadz offer larger-than-average surfaces that can help game play.

The Surface1030 pad includes two interchangeable surfaces, with a smoother and rougher finish. It also includes a cable clip to keep the mouse's wire out of the way during fragging. The Logitech WingMan has an unusual fabric/plastic surface 3M developed.

The surfaces of the Ratpadz and Everglide pads might remind you of a

plastic cutting board. In fact, that's where the idea for Everglide's pads originated.

"I was frustrated with my foam mouse pad and threw it away one evening. I grabbed a plastic cutting board and found it to be an extremely accurate and exact experience," says David Welsh, CEO of Everglide. He contacted the cutting board company and had several hundred made for Christmas gifts. Four years later, the company has sold 4 million mouse pads. Although the pad no longer looks like a place to chop veggies, you can still glimpse its origins in its dense plastic, textured surface.

Which pad is best is certainly a matter of personal preference, but one thing is for sure, you won't go back to that ratty foam pad again.

### Keep Your Ports Where I Can See 'Em

Phrenology, the study of the structure of the human skull and its relationship to one's character, was a popular medical theory in the 18th and 19th centuries. Although the theory has been widely discredited, even an 18th-century

quack could diagnose the tell-tale bumps that come from hitting your head on the desk while swapping cables in the back of your PC.

Cable swapping does not have to go hand in hand with stooping and bumping your head, however. Instead, move the ports you use most to the front of your PC. You can buy or build a kit that uses a drive bay to house USB, IEEE

1394, audio, or any of your favorite hot-swappable ports.

If you're up to some hardware hacking, check out WNCOMP's guide to installing a five-port USB hub in a 5.25-inch drive bay ([www.wncomp.com/guides/hubmod](http://www.wncomp.com/guides/hubmod)). The project involves removing the housing from a hub and then installing it in an internal CD-ROM case. In addition, ready-made panel-mounted USB hubs are available,

too, at [myCableShop.com](http://myCableShop.com) ([www.mycableshop.com/sku/ST3504USB.htm](http://www.mycableshop.com/sku/ST3504USB.htm)), and other sources.

If you need a drive in every bay, check out Antec's Easy USB ([www.antecinc.com/product/easy\\_usb/usb.html](http://www.antecinc.com/product/easy_usb/usb.html)). It adds two USB ports to a 5.25-inch bay, leaving room for a 3.5-inch drive, such as an internal hard drive or Zip drive, in that bay. The Easy USB costs about \$12.

Frontx ([www.frontx.com](http://www.frontx.com)) sells front-panel port bays that can include your choice of USB, IEEE 1394, RCA video, headphone, microphone, audio-in, joystick, and serial ports. The bay does this by rerouting cables from the rear of the PC or the motherboard to the front panel. The \$29 "multimedia ports" kit adds headphone, microphone, audio in, and game/MIDI ports. In addition, you can build your own port bay configuration. **CDU**

by Kevin Savetz



The Everglide Attack mouse pad is one example of a pad built for gamers. Such pads are typically oversized and have high-traction surfaces that provide better precision and control during gaming.

## Infinite Loop

### Just Like Bunnies

In 1943, there were fewer than 2.5 billion people on earth. That same year, IBM's Thomas J. Watson predicted that "there is a world market for about five computers."

By 2000, Earth's population had more than doubled to 6.1 billion and the number of computers in use worldwide had exploded to 521 million. At the end of this year, there will be about 6.3 billion humans on earth and approximately 697 million computers.

By 2005, humans will have multiplied to 6.5 billion and the number of computers will reach just more than 1 billion.

The United Nations Population Division expects Earth's human population to reach about 9.3 billion in 2050. But if computers continue their exponential growth rates, there will be more than 22.5 billion of them at that time, or 2.4 for every person on the planet.

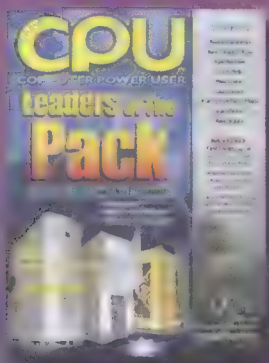
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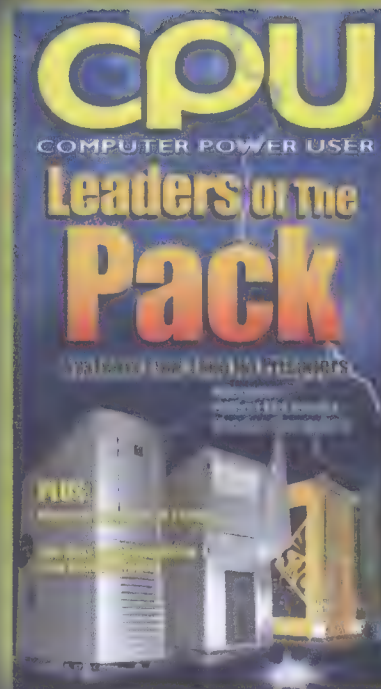
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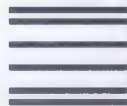
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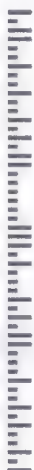
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# Technically Speaking

An Interview With Kent Larson,  
MIT Director Of The Changing Places Consortium



From Ray Bradbury to the Jetsons, we have plenty of visions for the “home of tomorrow,” but apart from Bill Gates’ abode, there are precious few indications of such homes becoming a reality. Urban apartments and suburban housing developments are sterile, lifeless, and depressingly mediocre. Nearly all the technology they contain is retrofitted. We still think of technology being inherent to things—the PC, entertainment center, kitchen appliances—and not to the home environment itself. Moreover, modifying the structure of the home and implementing technology into the home’s fabric is costly and a nightmare to implement.

At MIT, noted architect Kent Larson heads a small fleet of researchers in a project called Changing Places, a joint MIT Department of Architecture and Media Laboratory consortium.

Changing Places encompasses the prior House\_n effort, a collaboration of MIT and numerous corporations aimed at redefining how homes are designed and built to meet the information needs of most people. The test bed for House\_n will be the “Living Laboratory,” a next-generation research house designed to easily swap out modular “infill” components. For example, you could swap a low-tech cooking area, built as a prefabricated module, with a different infill piece wired with the latest networked appliances and communications consoles. Nearly every part of

the building will have hundreds of sensors that can provide feedback to residents, letting them make better decisions about their living situations. By contrast, the Living Laboratory makes our present three-bed, two-bath abodes look like inhospitable caves. ▲

by William Van Winkle

**CPU:** Is the Living Lab completed yet?

**Larson:** No, but we have a concerted effort to raise the necessary funding. We actually made it more difficult for ourselves by making it more ambitious—but also a lot more interesting. The structure we’re going to build is really a series of laboratories. So we have a house lab, an apartment lab, an exhibit lab linked to the MIT Museum, and a facade lab to test high-performance building-envelope components.

**CPU:** Are there major differences between the house and apartment labs?

**Larson:** We’re thinking of the house lab as more of a model for the single-family American house. The apartment lab is more for high-density urban living, particularly in

Asia and Europe, where there are different space requirements. Also, the technologies are different. For the house, we’re looking at building it out of a chassis with integrated infill. So we have ductwork, power, communication, flashing, mechanical attachments, sensors, etc., all built into the basic structure of the house, and then everything else is a component that plugs into that chassis. With high-density apartments, the chassis is, of course, very different because in a high-rise building that chassis system may be steel or concrete, but it’s just a variation of the same idea.

**CPU:** How do today’s homes fail to meet people’s information needs?

**Larson:** Well, homes today do not communicate effectively with their occupants.

Part of what we’re looking at is how you can take advantage of this more sophisticated infrastructure to give people information that is responsive to where they are and what they’re doing. How can you take advantage of that with respect to proactive health and energy conservation? Those two application areas are some of the things that we’re really quite interested in. We’re not particularly interested in entertainment or conventional communication technologies, except to the extent these technologies can be applied to new purposes. It is our purpose to focus on developing technologies and applications. There is very little focus on health and behavior-related energy conservation in the home.

For example, we are developing ways to encourage healthy behaviors. Part of that involves giving people what we call



just-in-time information. In other words, if you're about to open the window when the air conditioner is on, it might tell you what the implications of that will be for your comfort and cost. If you're concerned about your diet, it may give you information about nutrition right there in the context of food preparation. In other words, it's context-sensitive information. To make that work, you have to know what people are doing, where they are, you have to have the ability to deliver information to them in that place and time. You also have to understand a lot about user interface and cognitive psychology in order to deliver information to people that is useful for them rather than simply annoying.

**CPU:** If I opened that window, would the house talk to me over a speaker, or is there going to be a touch pad readout by the window that will flash me?

**Larson:** There are different ways. We've looked at really simple ways of giving people information. One example could be a tiny LED light on the window frame that is green or red. If you open the window, the red light turns on. It just gives you a very subtle message that you might want to reconsider this if the air conditioning system is running. You may go to some more conventional display to get additional information. There are thousands and thousands of different ways you might communicate to people, and one of the things we're building this lab for is to experiment with which are the most effective. It's not like we have the answer now. No one has ever built a research facility to systematically investigate these issues in the context of life.

**CPU:** So it's not like a late '80s Cadillac door that said, "Hey, the door is open."

**Larson:** Right. Well, that was bad interface design. Some of the most challenging problems in design have to do with interface—the design of interaction, the design of experience. How can you design for complex activities that are always in flux? This requires really careful attention

to interface, meaning how you communicate information to people and how you give them control of complex systems.

**CPU:** I went to an Intel-sponsored Street of Dreams recently and was amazed at how low-tech it felt. There were flat panels in every room, but it seemed the biggest innovation was simply installing a few 5-inch touch screens on the walls. There was no "intelligence." Will sensors like those you're working with change this situation?

**Larson:** First of all, most of what industry has produced has been demonstration facilities, not research facilities. Their interest is in taking a conventional house and grafting whatever gadgets they can throw into it that are already on the market. They often serve a useful purpose, but that is very different than what we're doing. In fact, if it's out on the market, we typically don't want it in our house. Also, conventional houses don't have the kind of infrastructure that will allow you to efficiently plug in all these new devices, like sensors, without hiring expensive and increasingly scarce skilled craftsmen to painstakingly string them all together.

What we're looking at developing is a sophisticated enough computational infrastructure that you can plug in modular components on the fly and they'll just work. So you could have hundreds and hundreds of sensors that plug into a sensor bus that runs through a house chassis. You plug them in as needed. A lot of these in the future will incorporate disposable electronics, so when the next better thing comes along you just plug it in. People will have choice, and they will have the infrastructure to craft it the way they want. You can also use all of this new technology simply to make a completely low-tech environment. If you want to make a highly responsive environment, then you can take advantage of a rich-sensing environment, depending on your needs and privacy concerns.

Cameras are invasive, and some people don't want that. Other people will choose

to have vision sensing because there are some very clear benefits that come from it, like a self-programming house that's really responsive, or with elderly people the ability to recognize when you've fallen and broken your hip or you're having a stroke. That requires a lot of information about the individual. People instinctively react by saying, "I'm concerned about privacy. I don't want cameras in my house." But if there is a very clear benefit and you've got a technology with privacy safeguards, and you are the one benefiting rather than some anonymous corporation, then a lot of people will choose to take advantage of this.

**CPU:** Say I want a new infill module for the kitchen. Aren't generic infill components going to be less aesthetically pleasing than custom-ordered components?

**Larson:** We are looking at the application of new fabrication technologies that don't limit you to generic components. The amazing thing about this new technology is that a cabinet shop can make a thousand unique cabinets on their line with the same efficiency as a thousand identical ones. The reason is because they're all using computerized numeric control, or CNC machines. You can make anything, any different size or finish or color, because as long as there is no bottleneck in the data getting to these machines, potentially there is no output penalty.

**CPU:** So it is something like book printing on demand?

**Larson:** That's a good analogy. With book printing on demand, you're limited to certain size paper and a certain thickness of the book, etc. These cabinet companies are limited to stock materials that are staged at one end of the factory, and they can't make a panel bigger or smaller than a certain size because the hardware won't fit on it. But as long as you play by the rules, they can pretty much do anything. **CPU**

To read our entire interview with Kent Larson, go to  
[www.smartcomputing.com/cpumag/may02/larson](http://www.smartcomputing.com/cpumag/may02/larson)



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# Under Development

## A Peek At What's Brewing In The Laboratory

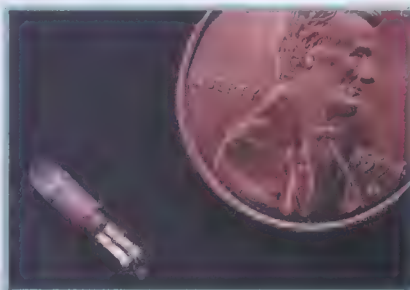
Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

### When Chips Get Under Your Skin

**T**he idea of computerized implants has almost become a cliché, without so much as a single product on the market outside of the health industry. Sci-fi writers have espoused implants for decades, privacy groups have clamored that implants capable of communicating with the outside world will spell the end of civil liberties, and extreme Christian conservatives have prognosticated implants will be "the mark of the Beast" as told in the Bible.

Well, place your bets. Florida-based Applied Digital Solutions ([www.adxs.com](http://www.adxs.com)) is awaiting FDA approval for its VeriChip, a rice grain-sized device that's implanted under the skin. The chip stores up to 128 characters and six lines of text. When a scanning device is run above it, a magnetic coil in the chip sends a 125KHz radio signal to the scanner, communicating the chip's data. If this sounds like the ID chips veterinarians have been implanting in pets for years, it should. In 2001, ADS purchased Destron Fearing, a prominent maker of animal implant chips since the 1990s. However, while pet implants cost about \$35, the VeriChip will cost about \$200. ADS is still planning for the encoding, distribution, and insertion of chips through certified doctors and clinics.

VeriChip medical applications are obvious enough. Customers that have serious allergic conditions and other maladies are already waiting for this chip you can't lose, unlike a key chain fob or wrist bracelet.



The minuscule size of Applied Digital's VeriChip means it leaves practically no external evidence of its presence. The tiny ID chip is inserted under the skin with a wide needle and, presumably, a little topical anesthetic.

Given security concerns after Sept. 11, personal ID is another target market.

More intriguing uses include tracking. ADS has already booked several clients from South America, where kidnapping is a serious problem (the chip could identify a victim unable to speak). The VeriChip is being marketed alongside ADS' Digital Angel ([www.digitalangel.net](http://www.digitalangel.net)), which links a biosensing and envirosensing monitor with GPS tracking. For example, if a person wanders outside of a given boundary, an alert is sent to Digital Angel, which can notify and assist a third party in giving help. Ideally, Digital Angel technology will be melded with the VeriChip and also implanted, but this would require a power source. Interestingly, Applied also owns and is developing a product called Thermo Life, a thermoelectric generator that uses body heat to produce electricity. Today, Thermo Life is an external device, but then again, so are most ID systems. ▲

### Feeling Blue About Next-Gen Storage

**T**he question is obvious: If 650MB CDs gave way to 4.7GB DVDs, what comes next?

The answer has to do with laser wavelengths. CD technology relies on infrared lasers that operate at 780nm. DVD lasers use red lasers with 630nm-to-650nm beams. The shorter wavelength means you could pack the "pits," which constitute values of 0 or 1 in the disc track, closer together. After years of R&D, blue-violet lasers (see pg. 45) with 405nm wavelengths are ready to fuel the next wave of optical drives. Near-term capacities will hit 27GB per disc side (six times that of today's DVDs), and 50GB designs are in the works.

Furthermore, a zippy 36Mbps data transfer rate assures high image quality, although high-speed interfaces such as USB 2.0 and IEEE 1394 (FireWire) will be needed to support it.

To avoid yet another video format war, nine of the biggest names in optical technology joined forces to announce the Blu-ray Disc format last February. Final specs are expected in spring 2002. The companies include Hitachi, LG Electronics, Matsushita, Pioneer, Philips, Samsung, Sharp, Sony, and Thomson Multimedia. Pioneer Electronics Senior Vice President Andy Parsons notes that although Blu-ray is a multimedia technology ideal for video use, it stands little chance of displacing DVD movies anytime soon.

"It's a huge undertaking for the industry to settle on a single publishing format," says Parsons. "I mean the last significant one before DVD was VHS. So I see DVD staying around for a long, long time. Blu-ray is best suited to recording MPEG broadcast streams, like those used for HDTV. However, based on the research I've done, less than half a million people in the U.S. have the ability to receive HDTV, so it's premature to expect that we'd be shipping any [Blu-ray] products soon. The technology will be in the consumer space if and when there are enough users watching HDTV who want to record it." ▲



## This Chip Will Self-Destruct In . . .

**T**he next time you're trapped behind enemy lines faced with imminent capture, don't worry about having to swallow your top-secret data. If your nuclear-fusion secrets are on the right kind of silicon chip, you can detonate the wafer instead.

University of California, San Diego (www.ucsd.edu) researcher Frederic Mikulec, working under professor Michael Sailor, was doing routine work scribing a silicon wafer with a diamond cutter when the chip suddenly exploded.

Another tabloid case of spontaneous combustion? Not quite. Gunpowder is a mixture of carbon, sulfur, and potassium nitrate. Similarly, a silicon-based explosive will detonate when mixed with potassium nitrate. Mikulec, however, was working with porous silicon and gadolinium nitrate. Unexpectedly, the result was the same as using potassium nitrate. The

explosive yield is roughly equivalent to gunpowder, thanks largely to the increased surface space inherent in porous silicon.

Sailor doesn't like talking about exploding chips being used as booby traps in electronic consumer devices. He envisions the chip being developed for chemical testing in field operations, perhaps even biowarfare.

"If you want to look for lead or other toxic metal ions in a sample of groundwater," says Sailor, "typically what's done is that the sample is taken back to a laboratory and analyzed in an emission spectrometer. In that spectrometer, the groundwater is mixed with other chemicals and burned, and the flame produces a characteristic set of colors that correspond to certain chemicals. What we did in this experiment is to show that you can miniaturize this analytical laboratory

using porous silicon and gadolinium nitrate into something that's as small as the diameter of a human hair, so that when you're out in the field, you can do this flame-emission spectrometry instantaneously with a device that fits in the palm of your hand."

Because the explosive reaction happens so quickly and cleanly, the corresponding flames are exceptionally free of impurities, which make them excellent for use in spectroscopic analysis. Other potential applications include making rocket-propelled MEMS (micro-electromechanical) machines or ultra-small spy devices that explode before there's a chance of discovery. The only thing required to initiate the explosion is an electrical impulse across the chip area containing the blasting cap, something that could be done via a timer or a remote signal. ▲

## Bots With Bite

**T**he prey rests calmly, munching its lunch under a tree. In the distance, a predator senses its meal ticket and moves in slowly. The prey, absorbed in its feast, doesn't notice its imminent danger. The predator strikes, trapping the prey in its grip. The prey squirms, but to no avail. A long fang flares from the predator and sinks deep into its victim, draining its lifeblood. Soon, the prey is dead and the predator lopes back to its pack.

This isn't a scene from the Serengeti. The savannah in question is a 95- x 20- x 9-meter arena in the UK's Magna Science Adventure Centre (www.magnatrust.org.uk). The trees are actually shafts of light, and the prey and predator are robots decked out with 32-bit Hitachi 7045 SH2 micro-

controllers. The prey soaks up energy from the light beams. The predators suck their energy from the prey (or one another) if an

attack is successful. Both breeds can sense food sources and one another based on infrared observation.

Until now, AI simulations have either run as software constructs or glorified

professor Noel Sharkey and set to run from March 27, aims to see if robotic animals will grow to mimic the behavior and survival tactics of their flesh and blood counterparts.

As in nature, each robot has two functions in life: eat and breed. Instructions for both functions constitute the robots' genes. If the robot survives long enough, it is allowed to upload its genes into a remote computer. Offspring robots receive a random half of each parent's genes, plus an occasional random mutation. Researchers hope the bots will evolve strategies, such as learning better escape methods, grazing in herds for protection, and hunting in packs. Such progress would be a significant leap in the ability to

design robots able to adapt to extreme environments, such as in mine works or the harsh Martian surface. ▲



Mix "Battle Bots" with Darwinian theory and you've got a science exhibit guaranteed to thrill visitors of any age. Professor Noel Sharkey oversees his evolving creations at the Magna Science Adventure Centre in northern England.

games of "tag" rather than life and death. Magna's experimental Living Robots exhibit, designed by British robotics guru



# Back Door

## Q&A With Seamus Blackley

**H**ead of Microsoft's Advanced Technology Group, a founding father of the Xbox, and a demigod in the gaming world, Seamus Blackley is a man of quick wit and kind words. After college, a temp job landed him at Looking Glass Studios, where he designed, programmed, produced, and even wrote music for such hit titles as *System Shock* and *Flight Unlimited*. From there, Blackley took an executive producer position at Dreamworks Interactive where, during a project review, he met Bill Gates and started to transform the gaming landscape.

**Q** The Xbox has so much technological power, but have developers really utilized all of its potential?

**Blackley:** There's some adjustment that needs to take place among the developers who are used to working on the other systems. A great example is the rendering engine. It really operates much more similarly to the engines used to render film effects. For instance, pixel shading is a technique for basically putting a computer behind every pixel, a program for every pixel on the screen. That's a very powerful technique for television and film rendering that allows you, say, to draw the dinosaurs in "*Jurassic Park*." And it's a more mature technique than simply throwing texture onto polygons. But it is something that requires a lot of work to use on the part of game developers. Instead of setting up their art department to make beautiful models and then polygon reduce them so that they run quickly on game hardware, they actually have to give their artists a full tool set and the control to be able to create models that can take advantage of this. So what you're seeing is people taking advantage of the raw power right now. As the next generation comes, and the generation after that, you're going to start seeing people take creative use of the full power of Xbox rendering features.



**Q** What's next in controllers?

**Blackley:** People have a lot of wacky ideas for controller devices, and there are a few you'll be seeing on Xbox. There's tilt, for instance. There are various kinds of motion sensors. I believe voice control is very interesting, and given the audio capabilities of Xbox and the broadband capability to enable voice chat and voice masking, that's pretty interesting. But I think you're going to have to wait until the next generation of consoles to see any big changes to controllers simply because the most important thing is consistency.

**Q** Bill Gates is notorious for two things: his genius and his temper. Have you met these two sides of the man?

**Blackley:** Oh, absolutely. I would say that the No. 1 reason I work at Microsoft is because of Bill. You need to realize that the temper only comes out when you try to bulls\*\*\* Bill. I've seen people try to do this, not knowing what they're talking about. And he's just way too smart for that. He's

a fabulous man. I got engaged in November, and Bill actually held the ring for me and handed it to my fiancée. He's got a great sense of humor, but technology is very serious, and he loves it very much.

**Q** What is the most mind-blowing experience you've ever had with an Xbox?

**Blackley:** Wow, there are so many. One was right after the terrorist attacks. My life became miserable because I was always carting Xboxes around, and of course, a prelaunch Xbox is a pretty exotic thing to be taking through airport security. I was actually very worried about it at first. I would start, well, mini-riots at the airport security stations because I'd have to take the Xbox out of my bag and put it through security. Of course, this was close to the launch, so there were a bunch of parents whose kids were clamoring to get an Xbox. So it would come out of the X-ray machine, and inevitably one of the guys who worked security would be a fan, and he'd look up and go, "Whoa! This is an Xbox!" And in all of the lines—I actually stopped airport security cold at LAX one time—people would come over. Even the guards with the M-16s would come over and ask to pick it up. It was crazy. Inevitably one of the National Guard guys would say, "I'm sorry, we have to keep this here for inspection for the next few days." **CPU**

For our complete interview with Seamus Blackley, see [www.smartcomputing.com/cpumag/may02/blackley](http://www.smartcomputing.com/cpumag/may02/blackley).

*William Van Winkle began writing for computer magazines in 1996. He was first published in 1990, the same year he took his first job in computers. He and his family live outside of Portland, Ore.*





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
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